# SCIENTIFIC AMERICAN

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## THE LIGHT DRAUGHT COMPOSITE GUNBOATS.

The rapid accumulation of barnacles and marine vegetation on the bottoms of steel-plated warships; the incidental reduction of speed, with an accompanying increased consumption of coal; and finally, the semi-annual docking necessitated, with its consequent expense, have troubled the navy department ever since the new navy began; and in the composite vessel—a mixed structure of wood and metal—with its bottom of planking coppered without, or, where greater strength required it, plated first with steel as above water, then sheathed with wood, also coppered, and the whole so fastened to the metal frames and plating by composition bolts that galvanic action should be averted, a system long urged by Chief Constructor Hichborn, is found a means of avoiding these evils, while adding greatly to the efficiency of the craft at all times.

The six new vessels will be of two different types, one having full sail power, and propelled, when steaming, by a single screw worked by a triple expansion engine; the other carrying sail enough only to steady them in a seaway, and driven by twin screws, actuated each by its own engine of the triple expansion type.

Their principal dimensions and general features are:

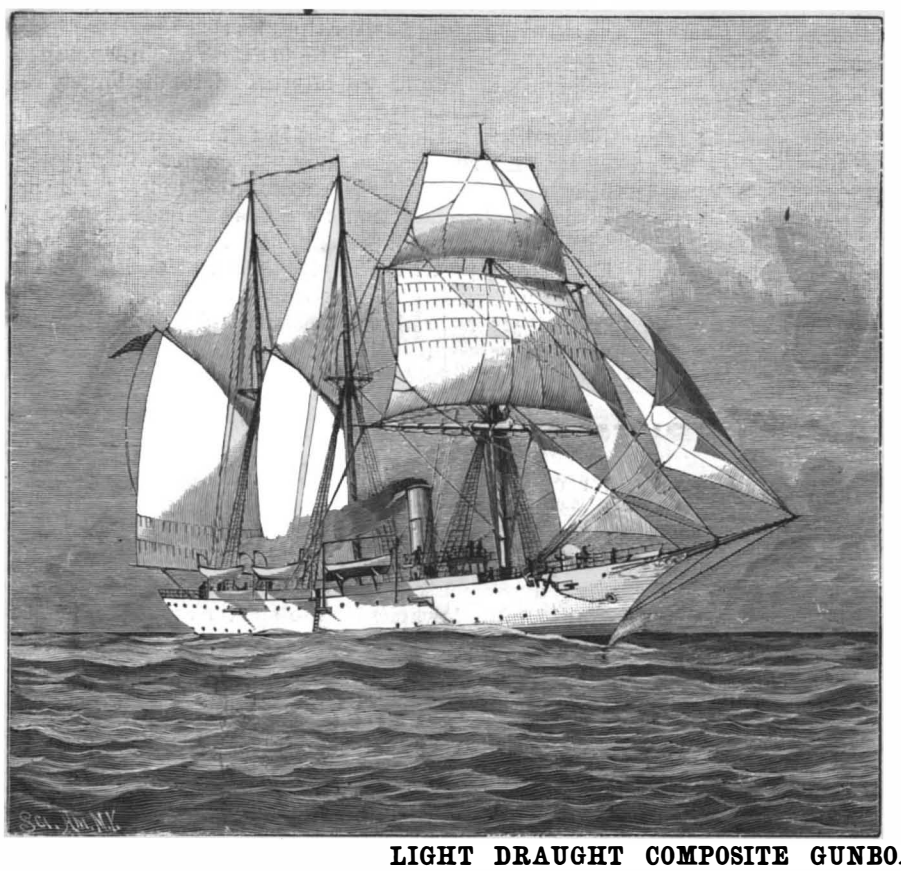
| | Single-screw Type. | Twin-screw Type. |
|---|---|---|
| Length on load water line | 168 feet. | 174 feet. |
| Beam, extreme, at load water line | 36 " | 34 " |
| Draught, normal, to bottom of wooden keel | 12 " | 12 " |
| Displacement, normal | 1000 tons. | 1000 tons. |
| Indicated horse power | 800 " | 800 " |
| Speed an hour, estimated | 12 knots. | 12 knots. |
| Coal supply, bunker capacity | 238 tons. | 250 tons. |
| Complement—officers, seamen, and marines | 146 " | 146 " |

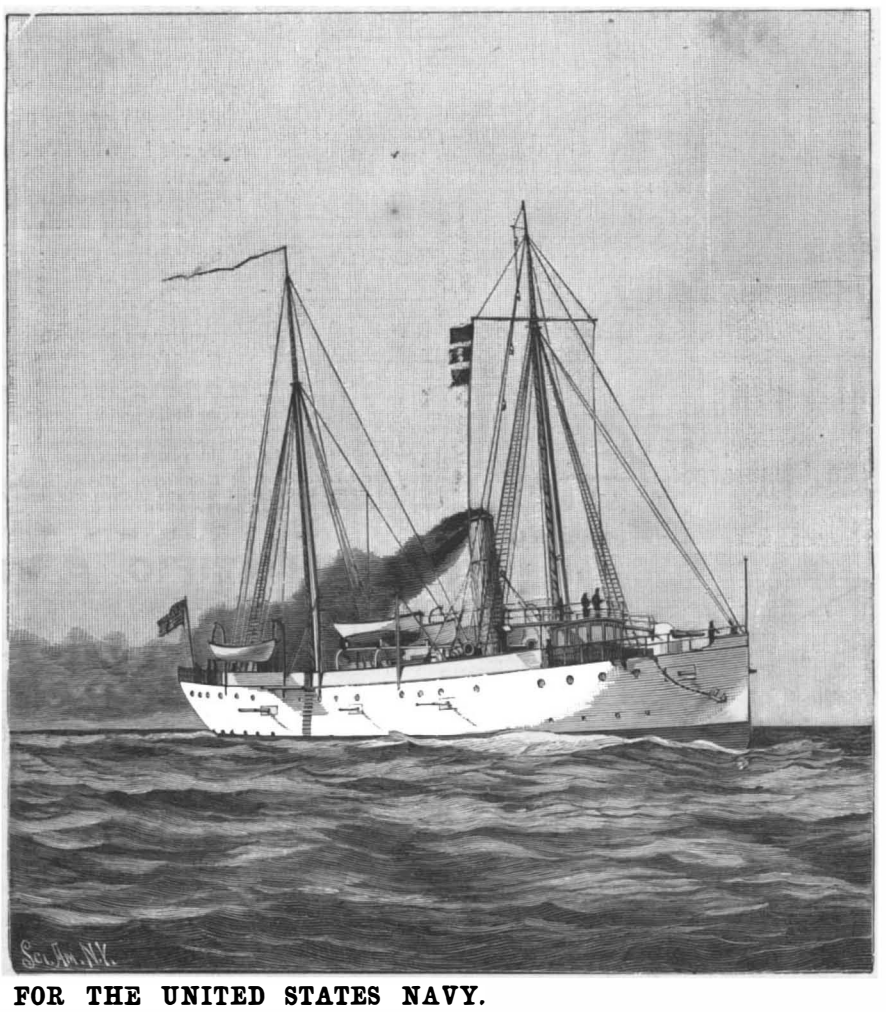
The armament, consisting entirely of rapid fire guns, will be composed of six 4 inch breech loading rifles, with 900 rounds of ammunition; four 6 pounders, with 2,002 rounds of ammunition; two 1 pounders, with 1,200 rounds of ammunition.

Two of the 4 inch rifles, one at the bow and one at the stern, will be carried on the main deck; the other guns, excepting the 1 pounders on the hammock berthing, will be placed most advantageously on the gun deck and well protected from musketry fire, to which the river and shallow water service may expose them.

The frames and all metal structural parts will be of steel, or of some other metal or approved alloy; the constructive time limit will be fifteen months from date of signing contract, and the limit of cost, exclusive of armament, is fixed at $230,000 each.

(Continued on page 39.)





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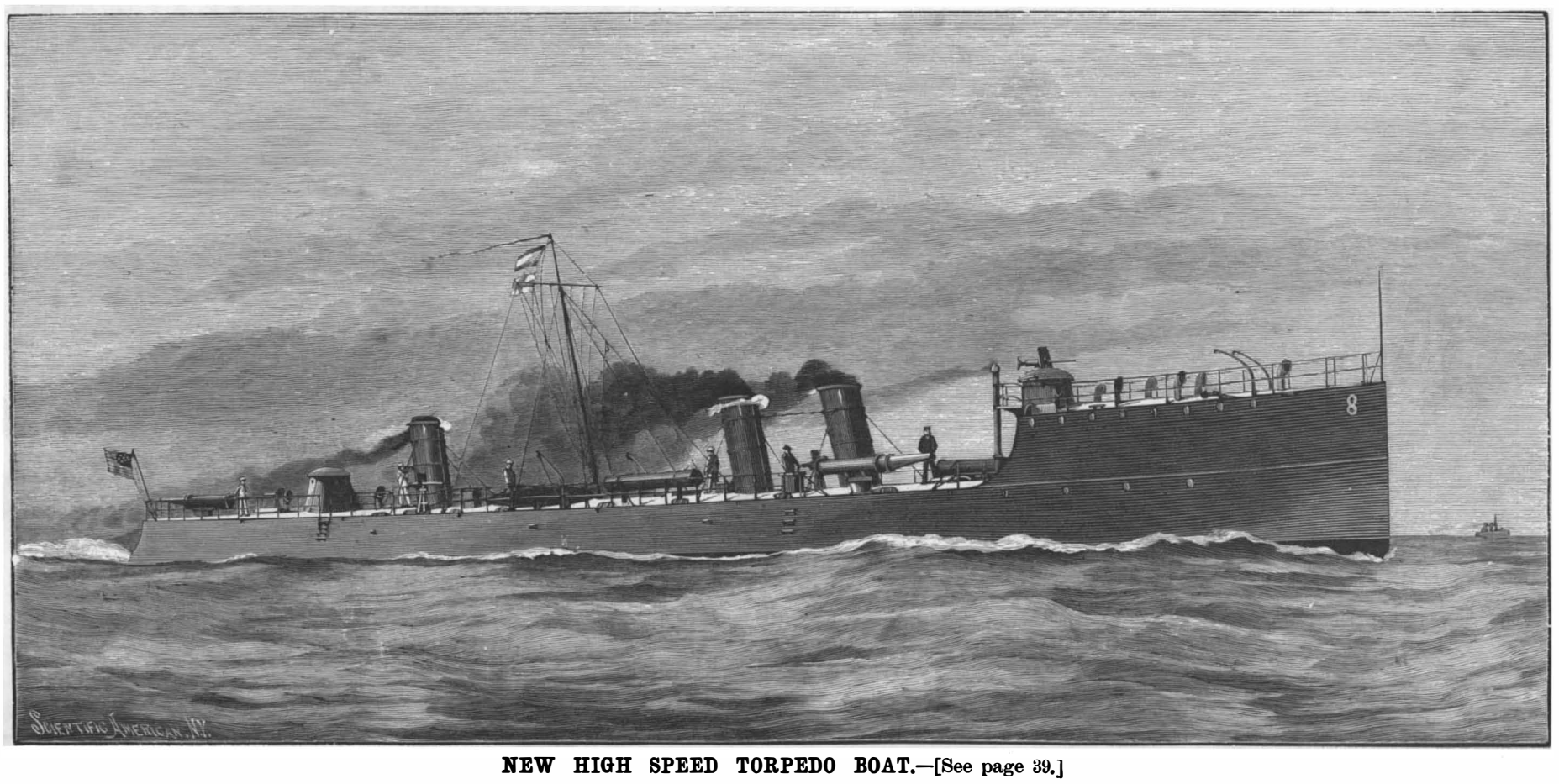

NEW HIGH SPEED TORPEDO BOAT.—[See page 39.]

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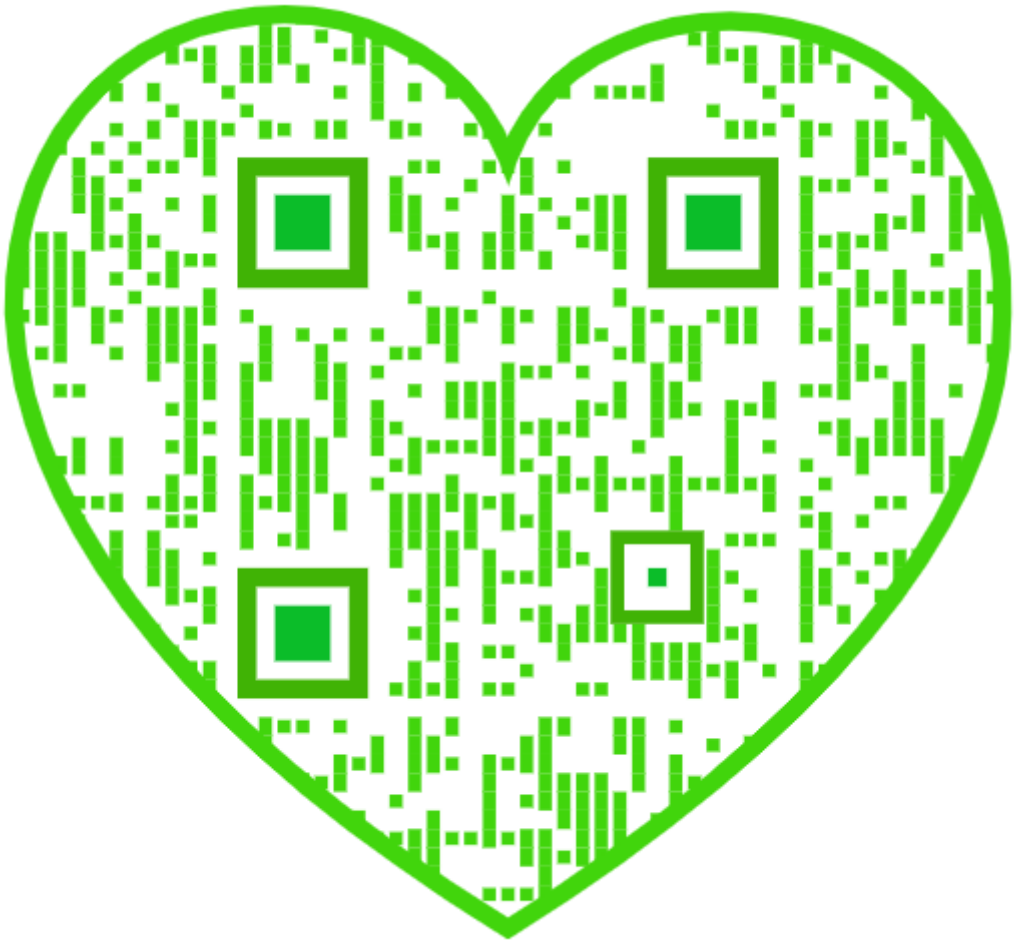

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**Contents.**

(Illustrated articles are marked with an asterisk.)


Anthion ..... 39
Antinonine ..... 39
Antiseptic, mercury oxycyanide ..... 36
Argon thermometers ..... 39
Arms, National Guard ..... 35
Army rifle, the new ..... 38
Battleships Kentucky and Kearsarge ..... 35
Battleship Texas, defects of ..... 42
Bicycle chain riveting machine* ..... 36
Bicycle notes ..... 38
Books and publications, new ..... 44
Bottle, the non-refillable ..... 42
Chimney, Engert's* ..... 36
Earthquake, New Hampshire ..... 41
Electricity in wine making ..... 39
Engine furnace draught ..... 34
Exposition, Atlanta, close ..... 41
Fertilizer, a new nitrated ..... 39
Fire box, Ingleton's* ..... 36
Garden, tropical, New Jersey* ..... 43
Gelatine, solidified ..... 39
Gunboats, new composite* ..... 33
Honey package wanted ..... 42
Horseless carriages and sanitation ..... 36
Inventions of Alfred E. Beach* 40, 41
Inventions recently patented ..... 44
Keynote of auditoriums ..... 42
Machine, typewriting, Beach* ..... 40
Nurse, qualifications of a ..... 42
Patent office, queerthings in the ..... 35
Pavements of kauri wood ..... 39
Plant, paper ..... 43
Plate, turret, test ..... 43
Railway, pneumatic* ..... 41
Railway speeds, accelerating ..... 34
Stone dresser, Aronstein's* ..... 37
Top curiosities* ..... 37
Torpedo boat, new United States* 33
Victoria regia* ..... 43
Wagon end gate fastener, Bell's* 36


TABLE OF CONTENTS OF

## SCIENTIFIC AMERICAN SUPPLEMENT

## No. 1046.

**For the Week Ending January 18, 1896.**

Price 10 cents. For sale by all newsdealers.


PAGE

I. ARBORICULTURE.—The Anise Seed Tree in Tonkin.—The production of anise seed oil, details of the harvesting of the fruit and manufacture of the oil.—1 illustration ..... 16714

II. ASTRONOMY.—Star Hunting by Camera.—A graphic and popular description of work in the Harvard Observatories ..... 16715

III. BOTANY.—Cordyline Banksii on Stewart Island.—An elegant lily from New Zealand.—1 illustration ..... 16714
Luddemania Triloba (Rolfe).—A recent discovery from the Andes of Colombia.—1 illustration ..... 16715

IV. CIVIL ENGINEERING.—The Island of Philæ, Egypt.—Proposed storage of the waters of the Nile and its effect upon Philæ.—1 illustration ..... 16711

V. ENTOMOLOGY.—The Transformations of Insects.—A valuable paper on the metamorphoses of insects and their relation to the plan of insect life ..... 16713

VI. GEOLOGY.—The Geological Society of America.—The annual meeting held at Philadelphia, December 26 28, 1895.—Abstract of papers read ..... 16712

VII. HYGIENE.—The Climate of Phœnix and the Salt River Region of Arizona.—By W. LAWRENCE WOODRUFF, M.D. A climate adapted for the invalid, with specific description of its peculiarities ..... 16716

VIII. MECHANICAL ENGINEERING.—Peache's High Speed Engine.—A new engine of the accepted high speed type.—1 illustration ..... 16720
Milling Machine for Preparing Test Pieces.—A valuable accessory to the work of the metallurgical engineer.—1 illustration ..... 16721

IX. MECHANICS.—Drill for Boring Curved Holes.—A curiosity in mechanics.—A drill which bores a hole in the arc of a circle.—1 illustration ..... 16721

X. METALLURGY.—Notes on Gold Milling in California.—By ED. R. PRESTON.—Continuation of this valuable treatise.—The grinding and amalgamating processes and mills.—11 illustrations ..... 16722

XI. NAVAL ENGINEERING.—Present Strength of the New United States Navy. The new ships of the American navy.—Resume of the ocean status of the country in case of war.—2 illustrations ..... 16717
The Harbor Defense Ram Katahdin.—A unique vessel just accepted for the United States navy.—A ship depending almost exclusively on ramming for offense. 2 illustrations ..... 16720

XII. PHOTOGRAPHY.—On a Method of Photography in Natural Colors.—A paper on advanced photography and the physical possibilities of color photography.—2 illustrations ..... 16725
Pigeon Post Micrographic Dispatches During the Siege of Paris, 1870-71.—The role played by photography in the production of microscopic messages for transmission by pigeons ..... 16716

XIII. TECHNOLOGY.—Commercial Fibers.—By D. MORRIS, C.M.G., M.A.—The continuation of this series of lectures.—Esparto, paper mulberry and cellulose industries.—2 illustrations ..... 16724


### THE ADVANTAGES OF THE INDUCED OVER THE FORCED DRAUGHT SYSTEM.

It has been abundantly proved that the excellent steam-raising qualities of the forced draught system are obtained at the cost of a very serious strain upon the material and fittings of the boiler itself.

A certain well known naval authority has characterized it as "an invention of the evil one," and it is a fact that many of the later ships that have been built in European navies have been put through their natural draught trials only, the naval boards not caring to subject the boilers to the severe ordeal of a forced draught trial.

Until very recently it has been a common experience for ships in the British navy to have their trial trips brought to a sudden close on account of leaking tube ends in the tube plate.

There are many fine ships afloat in the navies of the world to day which are provided with all the appliances for forced draught, and yet dare not make use of it except under the pressure of extreme emergency.

There is a further objection to this system, arising from the fact that it necessitates the use of the closed stokehold, in which the firemen work under the air pressure that is set up by the fans; all communication with the outside world being shut off by means of airtight doors. It has been sought to escape these difficulties by substituting induced for forced draught. Induced draught is similar in its action to natural draught, which is the kind that takes place in any domestic or factory flue or chimney.

Broadly speaking, induced and natural draught are the result of a vacuum which is produced at the bottom of the uptake of a boiler, in the rear of the furnace; forced draught results from an excess of pressure of the air in front of the furnace over the atmospheric pressure.

The two expedients which have been adopted in place of forced draught are to be seen on the United States cruiser Brooklyn, in which the natural draught is increased by the employment of smokestacks of exceptional height, and in the British ship Magnificent, where the same result is gained by placing a fan 8 ft. 6 in. in diameter at the bottom of each uptake. In both cases the rush of air through the furnaces is promoted by creating a vacuum at the rear of the furnaces.

The system adopted on the Brooklyn has this advantage, that it saves the weight, first cost, and running cost of the auxiliary engines for driving the fans as used on the Magnificent. Moreover, there is a considerable saving of steam—a weighty consideration in modern war ships, where there are so many auxiliary engines for pumping, lighting, and refrigerating purposes, that already use up a large amount of the total steam supply.

The use of abnormally lofty smokestacks has been tested in the merchant marine in the steamship Scot, which runs from Southampton to the Cape. Her smokestacks measured 120 feet in height from the firebars. Those of the Brooklyn are to exceed this, and the application of the system to this first class cruiser will be watched with great interest by the naval world.

### THE ACCELERATION OF RAILWAY SPEEDS.

The question is frequently asked as to how fast a passenger train can be run. The various conditions which affect the making of railroad records are intimately correlated, some being found in the engine, some in the train, and some in the roadbed and track upon which they run.

Taking the standard fast train of to-day as represented by the Empire State Express on the N. Y. C. and H. R. R. R., it can safely be said that when in 1893 it ran for a short distance at over 100 miles an hour, it was for that short spurt traveling up to the very limit of the possibilities of our present system of railway locomotion. The whole tendency of the age toward time saving makes it certain that, before the twentieth century is far advanced, the traveling public will be clamoring for a vastly increased rate of speed over present rates. The experience of the past teaches that when the patrons of a wealthy transportation company, whether on sea or land, demand a faster service—and are willing to pay for it—they usually get it.

We state a few suggestions as to the proper lines of investigation to be pursued in order to effect such improvements.

The Track.—This must be straightened as much as possible. On a tangent the whole tractive effort of the engine is available on the drawbar of the train. On a curve the effort is split into two components, one of which is expended against the outer rail of the curve, while the other is available to haul the train. The component which is lost in the outer rail increases with the increase of the sharpness of the curve; and vice versa, the more we can straighten out or "ease" the curve, the less will be the loss from this cause.

Grades must be Lightened.—The resistance due to grade is too obvious to call for elaboration here.

Heavier Rails must be Provided.—No amount of care can keep a roadbed in perfect level. The storms and frost of winter and the drought of summer will develop soft places. If the steel rail be deep and heavy, it will bridge these weak spots, and preserve the general level. The load of the train is concentrated at certain points of contact, where the steel tire meets the steel rail. The ideal track will distribute this concentrated load as evenly as possible to the widest possible surface of roadbed. For a speed of 75 miles an hour, 100 to 125 pound rail should be laid upon ties 6 inches by 10 inches by 10 feet long.

Better Rail Joints will be Required.—The joints are to-day by far the weakest point, even in our best tracks. The perfect joint should be as rigid, and yet as elastic, as the rail itself. To get the required depth for stiffness it should be of the sub-rail type, associated with some form of angle bar to secure alignment. With the introduction of 60 foot rails, the number of joints will be reduced to one-half, and some of the expense thus saved could be well spent in improving their quality. Whenever it is possible to hear the "click" or "hammer" of a joint, we may be sure that a certain amount of the momentum of the train is being absorbed at that point. A perfect track involves a silent joint.

Engines.—The fast express engine of the future will be a single driver. It has been abundantly proved that 20 tons on one pair of drivers will give all the adhesion necessary to haul an express train of to-day. Engines with single drivers are not troubled with slipping of the wheels, except occasionally in damp weather. At such a time steam sanding apparatus gives the drivers the necessary adhesion. Where loads are heavy, as in the slower and heavier passenger trains, or in freight trains, it becomes necessary to couple on an extra pair of wheels.

The Philadelphia and Reading engine is doing better work with a single driver than its sister engines of the four-coupled type. The single driver engine is easy to counterbalance and the internal friction is largely reduced.

The drivers will be of not less than 7 or 8 feet diameter, and running as they will on 100 to 125 pound rail they can be safely loaded up to 25 tons. This will give sufficient adhesion for 20 or 21 inch cylinders; which, with a steam pressure of 200 to 225 pounds and large steam ports, would give us a locomotive of very large high speed hauling capacity.

Cars.—It is in the reconstruction of cars that the greatest gain will be made. We have for many years been of the opinion that the weight of a Pullman car was out of all proportion to the number of people it carried. In a train made up of Pullman cars, the engine has to haul not less that 1½ tons of dead load for each passenger carried. On the race track the bicycle carries its load at average railroad speed on a deadweight basis of 20 pounds to the passenger. One hundred and fifty times as much deadweight to be carried per passenger on a railroad as on a bicycle. Making all allowance for the shelter and convenience of car travel, there is evidently something wrong. The weight of the car is excessive, and it is the outcome of the rough and dangerous condition of the earlier railroads, and of the competition among the builders to excel in providing a luxurious "palace" car. The car was made heavy in order that it might ride easily on rough track and hold together when it jumped the track; it was loaded down with heavy plate mirrors, solid hard wood carving and moulding, and massive brass and plated work in the attempt to beautify it. The two causes have both disappeared. Our trains stay on the track and automatic signaling has done away with collisions. They can safely be built lighter. A better taste has been cultivated among us in the matter of decorations and fittings, and Pullman cars could be relieved of much silver plating and glass plate, and yet be made artistic and pleasing in their interior fittings.

The weight per linear foot of an express train could be greatly reduced by reducing the length of the individual cars. A car rests upon its two trucks in the same way as a bridge upon its abutments. Like the bridge, its weight per foot will increase rapidly with its length. Two forty foot cars would not weigh as much as one eighty foot car; and though there would be four trucks for two, they would be of very much lighter construction. Moreover, the distribution of the load upon double the number of trucks would cause it to haul with greater ease. The trucks of a 50 ton Pullman car depress the track by their excessive concentration of load, and are always running in a hollow or, as it has been well expressed, "climbing up hill."

The cars could be further lightened in their construction by the substitution of high grade steel for timber. The use of nickel steel for the floors and side trusses, with thin plating for sides and roof, would result in a light, but very stiff and strong car. By furnishing the interior with rattan or basket work chairs and lounges, such as are to be found on some lines to-day, a further saving of weight could be effected.

It is a mistake to claim that light cars ride roughly. On rough track they do; but on first-class track weight ceases to be at a premium.

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### Queer Things That Are Sent to the Patent Office.

Every event of importance brings down upon the examiners at the Patent Office a myriad of impossible inventions which their wild-eyed originators believe to be the greatest things in the world. It is, therefore, expected at the Patent Office that the possibility of a war with England will cause all the idle dreamers in the inventing line to send new devices for killing men and sinking ships. There will be, if the war talk is continued, guns, ammunition, war balloons, unsinkable ships, new kinds of armor, armed flying machines, and other similar devices, ninety-five per cent of which will be absolutely worthless in the eyes of the examiners and will be rejected on this ground. The policy of England is quite different in respect to worthless inventions, for any invention with which a fee is sent may secure a patent and the visionary inventor may continue to haul up the empty buckets he has been letting down into the empty well. In the United States such discrimination is shown that the business of inventing has reached the dignity of a profession, in which many men are earning more than mere livelihood.

Upon the model makers devolve the worry and bother of the visits of these inventors, and upon the examiners of the Patent Office the responsibility of selection. In certain classes of inventions, for a patent to be granted a working model must be furnished, and this rule, in the case of the perpetual motion fiend and his ilk, saves the examiner a great deal of work and needless bother. In the case of ordinary freak inventions the matter is not so simple, for some inventions that were once thought to be senseless have, after the expiration of the patents, come into use and are of extreme value. There are other cases where the insanity of the idea of the inventor is too apparent. A man not long ago invented a plow with a cannon attach ment. If the farmer was attacked in the field at a distance from his home, he could turn on the battery and disorganize the attacking party. Another man came to the Patent Office with what he considered to be the discovery of the century. This was nothing less than a new method of tempering iron. He was quite sure that as soon as the patent was granted he would have no difficulty in disposing of it to the great iron and steel makers of the world, and that guns and armor of a superior quality could be furnished in a short space of time through his idea. The tempering solution he proposed was Jamestown weed, one ounce; apples, one ounce; turnips, two ounces; water, one gallon. The ingredients were to be cooked, and the iron dipped into the mixture.

Perhaps one of the most amusing patents ever granted was issued on the claim of an Ohio man in 1883. He evidently had not lived a great length of time on a farm, for his invention of a new corn planter, while original to an extreme degree, could hardly be put into use. The picture accompanying the patent is a work of art. It represents an old horse driven by a stout man, who holds the lines nonchalantly in one hand, an expression of much pleasure on his face, while at his side trudges a small hairy dog of the yellow variety. To the horse's forelegs, just above the fetlocks, are attached two small boxes to contain the feed. Ropes are fastened to catches in the sides of these boxes and lead through pulleys attached to a small saddle over the horse's shoulder and back to the horse's hind legs. As the horse moved forward each step of the hind leg opened the seed boxes, and corn was sifted down into the holes made by the front hoofs. The verbiage of the claim on this patent is as original as is the drawing:

First. I claim the combination substantially set forth with the cheap old horse, A, to the forelegs of which are attached the boxes, B B, that are to be filled with corn.

2. I claim the pulleys, C C, in combination with the strings, D D, substantially as shown in the drawing.

3. I claim the guide, E [a small iron affair shaped like a rowlock, fastened above the horse's tail, through which the lines pass], for the purpose set forth, and the sticker, H, to prevent the lowering of the tail.

4. I claim the fat driver, F, to prevent the said cheap horse from going too fast.

5. I claim the fat dog, G, merely as company for the driver.

6. I claim the worms (not shown) in combination with the crows, K K, substantially as shown in the drawing for the purpose set forth [a purpose not set forth].

A man who was afraid of being buried alive claimed a patent for a coffin of peculiar shape. The coffin was connected with the air above by an opening containing a small spiral staircase. If the supposed dead person concluded to resurrect himself he could seize the handles above his head and haul himself up, ascending the circular staircase at his convenience. If he was not strong enough to lift himself, a bell cord was situated near his hand by means of which help could be summoned from the neighboring office of the cemetery.

At first glance the idea of attracting noxious insects to imitation flowers where they could be killed by poisoned honey might seem absurd. Yet it is said that this scheme, a patent for which has been issued, works very well. A man out in California patented a scheme for killing destructive insects on fruit trees a number of years ago. He surrounded the tree with a balloon-like affair, and then injected a gas noxious to the insects but harmless to the tree. People laughed at him, and he was considered a crank. Two years ago, when the patent expired, people began to see what a good idea it was, and now the method is in extensive use in California. It will be seen, therefore, that patent examiners are obliged to be both careful and discriminating in judging the merits and demerits of an application.

A man not long ago invented a balloon attached to a trolley wire. This balloon was presumably for purposes of long distance investigations by telescope in time of war. Underneath the trolley wire was a motor which operated two large wooden propellers sending the car along and pulling the balloon. Another man invented a "steam nigger," operated by an electric motor in the regions of the pit of the stomach. The invention's use is not set forth. S. S. Applegate invented an arrangement for waking himself up early in the morning. A series of corks dangled above the place his head ought to be in a bed, and actuated by clockwork, made life a burden for the weary sleeper, until in self-defense he was obliged to get up. Another invention of the same kind was a contrivance for dumping the hired girl out of bed at 5 A. M. This, too, was actuated by clockwork. It was not considered to be so polite or gentle a method as that of Mr Applegate's. There was another invention intended to save the weary Benedict a few hours of slumber in the morning, for a mechanism placed under the kitchen fire was supposed to light it at any hour desired. There is a very funny model at the Patent Office of a cat made of sheet iron operated by clockwork It is intended to be placed on the roof of a house, woodshed or back wall in neighborhoods where the night is made hideous by nervous Thomases and Marias. At any touch or warlike demonstration on the part of its curious neighbors the clockwork sets the claws going all at once at a tremendous rate and there is a temporary rest for the weary. At the Patent Office there are models of Mark Twain's scrapbook, the pages of which are already mucilaged, and Lincoln's device for getting vessels off shoal places. This consists of bags of inflatable rubber, which, as occasion requires, are blown up and the vessel raised.

There are innumerable inventions to prevent accidents by collision on railroads. One of these patented recently consists of a very elaborate device by means of which one train runs over the top of the other, both presumably continuing on their way uninterrupted by the chance encounter. There is another English invention having much the same idea. The application is different, however, for the front of the engines are built wedge-shaped, with the wedge inclining more to one side than the other, by which means at the impact one train goes to one side of the track and the other train to the other side. Both trains are derailed, but the force of the collision is reduced and the loss of life brought to a minimum. Besides these inventions, there are modes of changing the shape of the features, modes of operating every conceivable thing on earth by windmills, modes of soaring through space, and traveling through fire and water without the least discomfort, modes of making steel and iron by simpler processes than have ever been dreamed of which uniformly do not work, and hundreds and even thousands of plans which have resulted in nothing but bother to anybody who has had anything to do with them. Certain methods have been patented for locating gold and silver by means of divining rods. Even methods of making gold are found. Here is an English recipe for manufacturing gold:

"Cut whole wheat straws into little square snips the width of the straw and mix this with a quart measure of the grains. Measure out half a two-quart saucepanful and set it aside. Fill the saucepan three-quarters full of water and set it to boil over the fire. Pour in the mixture and let it boil two and a quarter hours, adding water at intervals. Then strain off the liquor in thin layers in soup plates, and allow the same to rest thirty-eight hours at a temperature of 46° Fahrenheit. Then slowly bake them dry and find the gold adhering to the plates."

But of all the vast army of cranks who besiege the model makers and the examiners of the Patent Office, the perpetual motion fiend is the most troublesome of all. It is he who goes into the model maker's shop with a wild look in his eye, and, after peering cautiously about and swearing the model man to secrecy, brings out his senseless contrivance and sets it triumphantly on the work bench. He is the man of all men whom the model maker dreads most. Fortunately a recent order in regard to perpetual motion inventions requires a working model to be shown to the examiner before a patent can be issued in this class of inventions, and it greatly simplifies the task of the examiner. He listens to the enthusiasm of his visitor, and then quietly asks for the model. Of course this does not work, and when the inventor excuses the lack of continuous action on some ground, he is told to bring it in again when it is fixed. He leaves the room protesting that it is all right. Sometimes he returns and sometimes he doesn't. When he doesn't the examiner is pleased; when he does the same proceeding is gone through again.

Many inventors have come near—very near—the solution of the problem, but have not quite reached it. There was one crank who walked here all the way from Georgia. His perpetual motion machine consisted of a tall framework of uprights. In this framework was swung back and forth the trunk of a large tree. When the butt end of the tree was swung from one side to the other it struck a spring which was set loose and pushed the tree back to the other side. There another spring was set loose, and the action was supposed to be kept up forever, but it wasn't. Another man had a scheme which was more expensive and elaborate. He had a steam engine, a dynamo, a heat generator, and water. The office of the steam engine was to run the dynamo, that of the dynamo to operate the heater; the steam was to be generated from the water, and the steam would run the steam engine. Another man had a propeller in the bow of a vessel. The propeller shaft extended aft to a point opposite the paddlewheels, where the power developed by the propeller was communicated to them. He said that the forward motion of the vessel turning the propeller would develop enough speed to turn ten paddlewheels of similar size. Another man had a tipping board on a pivot, upon which a little car ran up and down. When the little car reached one end it released a spring, and the tipping board was pushed up so that the car went back again. This was accomplished, or was proposed to be accomplished, by one spring winding another up while it ran down itself. One of the most ingenious, perhaps, of these perpetual affairs is the invention of G. H. Furman. It consisted of an inner and an outer wheel. The edges of the cogs in the inner wheel were filled with shot, and as they descended they were supposed to fall on the outer wheel with such force as to send it around until the shot caught in its curve and fell again into the inner wheel.—N. Y. Sun.

### Improved Arms for the National Guard.

The conditions which are prescribed by the New York State Board of Examiners as desirable, and in some cases essential, in the construction of a suitable arm for use by the National Guard of the State of New York have been published. This statement is published in compliance with the following action of the board of date of December 19, 1895:

"Resolved, That the instructions relating to the design and construction of rifles and their test be printed and issued as a circular to proposing exhibitors of guns, and that said exhibitors be allowed until March 2, 1896, to comply with the same."

At said date, every proposing exhibitor will be expected to appear personally or by an acceptable representative, or, should this be for any reason impracticable, he shall deposit his keys with the secretary of the board at his office, 17 Adams Street, Brooklyn, N. Y., on or before said date.

The board may waive any condition not deemed absolutely necessary to the successful operation of the guns; but will in all cases assign a value to any proposed form of rifle which will be the higher as said rifle approaches more closely the ideal set forth in the circular.

The plan of test of guns submitted is subject to modification by the board, should such change be found in its judgment necessary or desirable in view of any difficulties that may arise in the execution of the scheme as published; but it is not anticipated that any important or extensive alteration of the plan outlined will be made.

Schedule A relates to the fundamental principle of construction of the army rifle; schedule B exhibits the method of testing proposed.

Full particulars may be obtained from a circular which includes schedules A and B. This circular may be obtained of the secretary, H. E. Abell, 17 Adams Street, Brooklyn, N. Y.

THE two new United States battleships will be named Kentucky and Kearsarge. In awarding the contract for these two vessels to the Newport News Ship Building and Dry Dock Company, at $2,250,000 each, Secretary Herbert encountered some opposition, especially from influences that were directed in favor of the Union Dry Dock Company, of San Francisco. While it was the intention of Congress to have one of the ships built on the Pacific coast if the terms were reasonable, in order to carry out this intent Secretary Herbert would be obliged to declare that the difference between the Newport News Company's bid of $2,250,000 for one ship and the bid of the Union Iron Works, of San Francisco, of $2,740,000 for one ship was only a reasonable difference, which he could scarcely do in the face of the decision made by his predecessor, Secretary Tracy, that this difference should not in any case exceed 3 per cent.—Marine Record.

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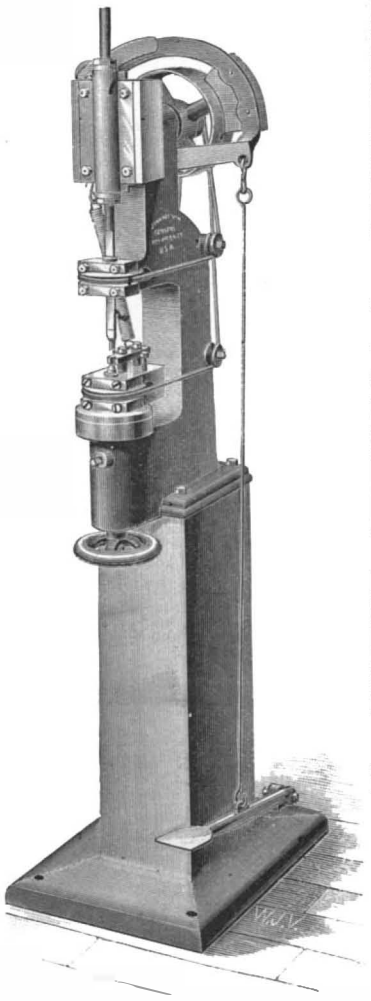
### A BICYCLE CHAIN RIVETING MACHINE.

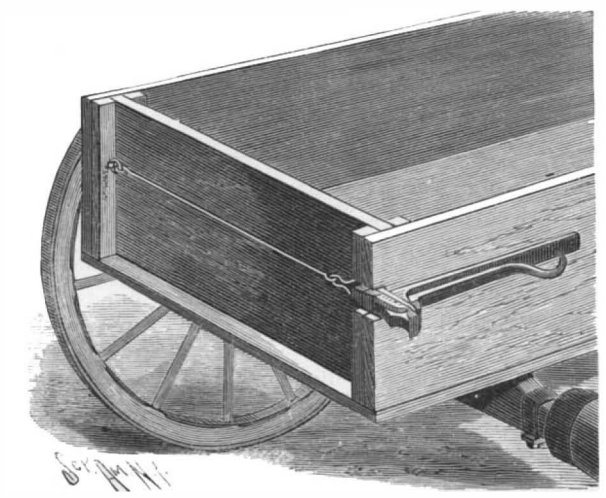
Builders of bicycles have adopted, for the manufacture of their chains, machines for hammering the heads of rivets over instead of spinning them. By spinning, the friction of the spinners against the rivets causes the metal to adhere to the spinner, thus marring and tearing the heads of the rivets. Also, with the spinning machine, it is a very difficult matter to spin over the hardened rivets which most of the bicycle dealers require to be used in their chains. The rivets are hammered by means of a reciprocating rotating hammer, also by a rotating anvil held against endwise movement, in an anvil carrier bolted to the table or support between which the chain passes. The illustration represents an improvement in that class of riveting machines designed to simultaneously head the opposite ends of the rivet, the object being to produce a simple, convenient, and effective machine, containing few parts, having a large capacity for accurate work, and not liable to derangement, at a small cost. The machine shown in the illustration, made by John Adt & Son, New Haven, Conn., is arranged for heading the rivets of bicycle chains. By removing the lower revolving fixture it is adaptable for the riveting of articles which require riveting. The distance between the revolving hammer and the table is sufficient to allow the placing of fixtures thereon for the purpose of holding the work, thus expediting its manufacture. The largest chain manufacturers in this and foreign countries are now using this machine, which has had several years' prior use as a plain riveting machine, i. e., without lower revolving fixture. It is also largely used by skate manufacturers to rivet the runners of skates to the foot pieces. During the last six months John Adt & Son's factory, F. B. Shuster, proprietor, the manufacturer of these machines, has been worked to its full capacity to keep pace with the orders for riveting machines and patent automatic wire straightening and cutting machines, a large one of which has just been completed and shipped to the Washburn & Moen Manufacturing Company, of Worcester, Mass., weighing nearly six tons and being about 32 feet in length. It is capable of cutting and straightening wire from ⅞ inch diameter and under and 21 foot lengths down to 1 inch in length.



THE JOHN ADT ELASTIC ROTARY BLOW RIVETER.

### A WAGON END GATE FASTENER.

A simple and durable device for securely holding the end gate of a wagon in place, and permitting of quickly loosening it for convenient removal, is shown in the accompanying illustration, and has been patented by Samuel W. Bell, of Waynesborough, Va. The end gate slides loosely in cleats, extending through one of which is a short screw rod with a nut on its outer end and an eye on its inner end, and the eye is connected by a rod with a link adapted to engage a projection from the fulcrum end of a lever pivoted in a bracket attached to the other side of the wagon body. The link is readily engaged with a recess in the outer end of the lever, when the latter is swung outward, after which the lever is swung inward close to the wagon body, as shown in the illustration, thus drawing the two sides of the wagon body toward each other to bind the end gate in place. As the screw eye may be drawn in by means of the nut, any slack in the link and transverse rod may be readily taken up, permitting of always closely binding the sides upon the end gate, and, as the clamping lever is entirely on the outside of the wagon body, it does not obstruct the loading or unloading of the wagon.



BELL'S WAGON END GATE FASTENER.

### Mercury Oxycyanide as an Antiseptic.

According to Drs. Monod and Macaigne, laboratory experiments have shown that the antiseptic power of a 1:200 solution of mercury oxycyanide is equal to, if not greater than, that of a 1:1,000 solution of corrosive sublimate. From the results obtained in upward of four years of hospital and private practice, the authors have come to the conclusion that mercury oxycyanide may be advantageously substituted for mercuric chloride in surgical practice. In accord with Tarnier and Vignal, they have found that a 1:200 solution of mercury oxycyanide, fully as well as, if not better than, a 1:1,000 solution of mercuric chloride, prevents cultures from developing, kills the microbes already developed by cultures, and sterilizes an infected body. To strengthen the evidence, they have been careful not to employ in their experiments pure cultures of streptococci or staphylococci devoid of spores, and consequently presenting but a feeble resistance, but dust from hospital wards, containing various microbes, such as the bacillus pyocyaneous, streptococcus, bacillus coli communis, and particularly a microbe resembling the bacillus anthracis and provided with spores, which resists a temperature of 212° Fah. The authors claim to have never met with symptoms of serious intoxication from the solution referred to. It should, however, not be employed for irrigation when there is reason to fear that the injected liquid may be retained. The fact that mercury oxycyanide does not attack steel instruments is also of great practical importance, seeing that it thus becomes possible to employ a single antiseptic agent for all purposes in the course of an operation.—La Semaine Médicale.

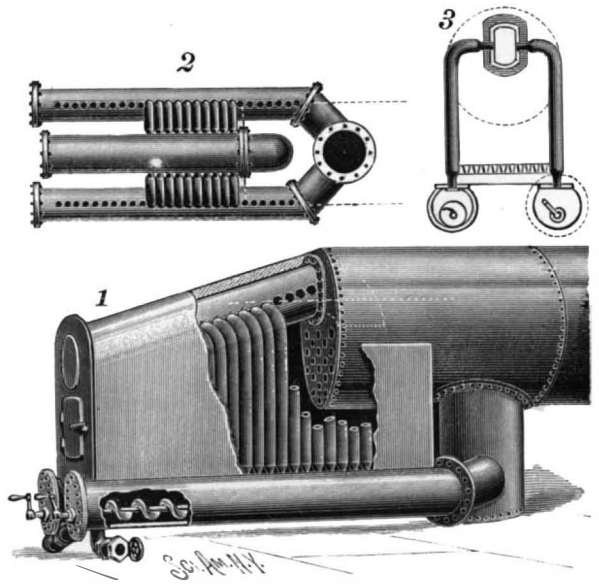
### Horseless Carriages and Sanitation.

So novel as yet is the mere idea of street traffic without the aid of horse power that the minds of most persons can hardly have touched the practical questions involved in such an arrangement. We are not, however, wholly without evidence bearing upon this subject. The London Lancet says it is needless to discuss the many economic, æsthetic, and social effects which would follow even the partial disuse of the horse as a draught animal. Another question, that of sanitation, calls for more attention from us. Our stables without the horse would be as pure as our homes if we were ourselves visible only as figures of still life, waxen, or ivory models. The stable pit filled with the defiled bedding of our obedient and faithful four legged servant would be known no more to our senses. The contagia bred in its midst and scattered in the dry dust of summer air, to find their way within our sleeping and sitting rooms, would be only the remembered signs of a past and primitive civilization. The germs of glanders would not harbor and be hatched, as they still occasionally are, in the stalls of overcrowded mews. Thus far the margin of profit is on the side of him who charges his vehicle with steam or electric energy. Much remains to be done, and much can be done, in this direction in order to insure not only the health of stabled animals, but of the human population in or near mews. The frequent and regular removal of refuse is one important means to this end, and by means of the methods, at once effectual and simple, employed for this purpose in well kept stables the work of cleansing can be carried out with ease and completeness.

### A BOILER FIRE BOX FORMED OF WATER TUBES.

The illustration represents a fire box constructed entirely of tubes, with their ends reduced to allow them to be brought tight together, forming a flame-tight tubular box, there being sufficient material in the tubes where they enter the water legs or drums to admit of proper fastening by expanding in the ordinary way. The improvement has been patented by Edward Ingleton, of Pottstown, Pa. Fig. 1 represents the application of the improvement, parts being broken away to show the construction, while Figs. 2 and 3 are plan and end views, showing the water legs or drums and their connection with the tubes and the boiler. At the bottom of the boiler, and separated from its interior by a grate, is a water pocket, branch pipes from which are connected with two lower water drums, in each of which is a screw adapted to be turned by a crank to facilitate the removal of sediment.

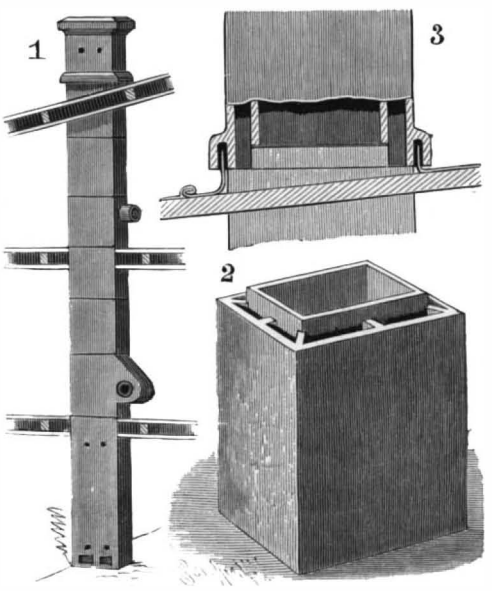
The lower water drums are connected on each side, by a series of circulating tubes, with a central upper water drum, which has an upward and rearward inclination, and a nozzle surrounds the opening leading from the upper water leg into the boiler, the nozzle being curved downward to such an extent that its lower end will be below the water line, as indicated by the dotted lines. A throat sheet is carried beneath the boiler, forward of the water pocket, and short non-circulating tubes, suitably capped, here form the rear side portions of the fire box. The fire box is jacketed, there being a packing of asbestos, or other fire proof material, between the jacket and upper drum, and between the circulating tubes and the vertical walls of the fire box jacket. It is designed that this fire box may be readily removed from the boiler for cleaning or for repairs by breaking three joints only, removing the bolts from the flanges of the water legs where they connect with the head of the boiler and with the branches from the water pocket.




INGLETON'S FIRE BOX FOR BOILERS.

### AN INEXPENSIVE, EFFICIENT CHIMNEY.

The chimney shown in the illustration is designed to be built up of sections after the manner of drain pipes, of clay or other suitable material, each section having an inner wall forming the smoke flue, and connected to the outer wall by ribs. The improvement has been patented by Charles Engert, Humboldt Street and Van Pelt Avenue, Brooklyn, N. Y. Fig. 1 shows the chimney in its relation to the floors and roof of a building, Fig. 2 representing a plain section and Fig. 3 the top section, which has an outside flange to receive the turned-up edge of the tin or other roof sheathing, and thus make a tight weather joint. The lower section is preferably long enough to reach from the basement floor to the floor above, and has bottom holes extending entirely through it, through which the soot may be removed, while other perforations, extending only through the outer wall of the section, in the side flues of the chimney, afford means of ventilation, there being similar openings in the top section above the roof. The several sections are connected by a suitable cement, and on each floor are suitable projections to facilitate making connection with the funnel of a stove or heater, each connection communicating with an inner, upwardly bent auxiliary flue delivering into the main inner flue, and not interfering with the draught of the auxiliary flues below. This chimney provides for efficient ventilation, may be quickly built, and the sections break joint in such manner that there is little likelihood of an imperfect joint through which fire and smoke may pass.




ENGERT'S CHIMNEY.

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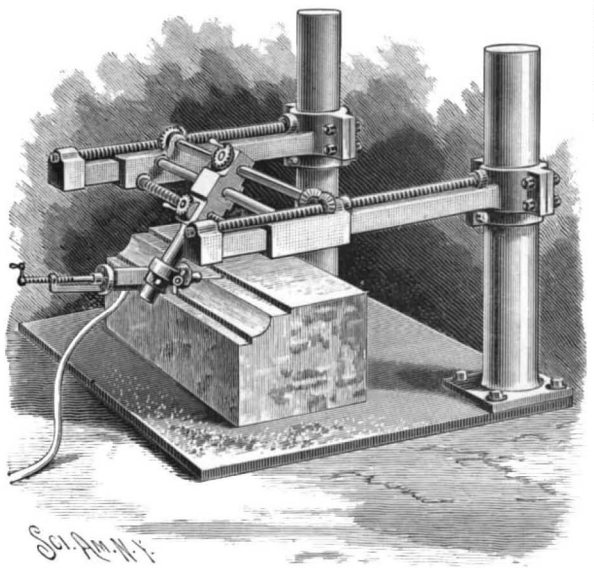
### AN IMPROVED STONE DRESSER.

For quickly and accurately dressing stones to any desired configuration, the machine shown in the accompanying illustration has been invented and patented by Richard Aronstein, Mogollon, New Mexico. Adjustable clamps upon suitable columns support two horizontal arms upon which are fitted to move two slides rigidly connected with each other by a rod and a screw shaft, and in the slides turns a shaft which, with the other shaft and rod, forms a support for a longitudinally sliding crosshead on the lower end of which is clamped a stone-striking machine, preferably in the shape of a rock drill. The crosshead, with its striking machine, is moved longitudinally by a beveled gear wheel nut on the screw shaft, in mesh with a beveled gear wheel turning on a stud on the crosshead, the wheel having a handle to be taken hold of by the operator. The upper shaft has a longitudinal keyway engaged by a key on a gear wheel in mesh with a wheel turning on a stud on the crosshead, the latter wheel having a handle, by turning which gear wheels at the ends of the shaft actuate bevel gear wheel nuts on screw shafts secured to the horizontal arms. The nuts turn in bearings in the slides, so that by turning the handle the operator feeds the crosshead to and from the work.



ARONSTEIN'S STONE DRESSER.

### CURIOUS TOPS.

I am in the habit of bringing home from my travels a few playthings, which, put away in a drawer, afford pleasure to my little nephews. Being desirous one day of getting a little order into this collection, I found therein a number and variety of tops that surprised me, and I set them aside. The idea occurred to me to examine them in detail and to compare them, and, in doing so, I was struck no less by the ingenuity of the manufacturers in introducing an element of novelty into a plaything so ancient and so simple in its primitive form than by the scientific interest of certain of the combinations realized.

I have adhered to the strict definition of the top, that is, a revolving body held in equilibrium upon its vertical axis through the rotary motion that is given it, and have thus had to exclude several very curious playthings, and especially the "air turbine" and the "magic box," as well as various others in which the object set in revolution is not a top, properly so called, but a fly wheel whose axis is held by supports.

I have divided my tops into two great classes:

I. Those which revolve, as I may say, simply in order to revolve, or, in other words, those in which one has had in view merely the rotary motion and the momentary equilibrium resulting therefrom. I have divided them into different catagories according to the way in which the rotary motion is given them.

II. Those in which the rotary motion is applied in order to produce another effect — optical, acoustic, mechanical or otherwise.

#### I. SIMPLE TOPS.

1. Tops Set in Motion by Hand.—This category comprises the teetotums. I have, in the first place, the ordinary teetotum, set in revolution through the upper part of the axis. That of Fig. 1 has the pretension, I think, to represent a dancing dervish with arms swinging. The "top" teetotum (Fig. 2) differs from the preceding, in that the fingers grasp it by the point. The "domino" or "die" teetotum (Fig. 3) may be used for different plays. The "centrifugal" teetotum (Fig. 4) and the "cyclone" teetotum end the list of these forms of the top.

2. Whip Tops.—I know of but two characteristic types of these—the common one (Fig. 6), whose conical form is one of the oldest known, and the "mushroom" (Fig. 7).

3. Peg Tops.—These are the tops of collections: the "short point" top (Fig. 8), the "long point" top (Fig. 9) and the "flat" top (Fig. 10). Fig. 11 shows a variant of Fig. 8. The cord, instead of being free, remains fixed to the top while, at the same time, allowing it to spin.

These varieties do not differ in form only, but are thrown differently. The short point top is held in the hand, the point downward and the forefinger resting upon the stem, and is thrown by a downward motion of the arm (Fig. 8A); the long point top is held inverted, the point in the air, and, in throwing it, the arm describes a semicircle, from back to front, like the hammer of the blacksmith (Fig. B). The flat top is held with the arm lowered, and is thrown with a horizontal motion, analogous to that of the ricochet, in drawing the cord toward the body (Fig. C).

4. Humming Tops.—In this category the rotary motion is given by the cord drawn rapidly with one hand, while the top is held in place. The "Dutch" top is held in a handle provided with an aperture with which either engages the upper part of the prolonged axis (Fig. 13) or its point (Fig. 14), and from which it is disengaged after it has been set in action by the cord. These tops are generally of wood and are hollow. They are often called "humming" tops. A top of an analogous system (Fig. 15), but of metal and provided with a movable cover, is sold as a sugar plum box. The axis is held by a piece in the form of an elongated C provided with two apertures.

In other systems the bearing point is taken upon the top itself, or else the top around which the cord is wound and its axis are interdependent. The prolongation of the axis enters a sort of sheath or handle in which it revolves freely, and which is held in the hand while the cord is unwound. Sometimes, again, the top is loose upon the axis, the extremity of the latter being held for throwing, and, when the top is freed, the axis being carried along in the revolution. The "Eiffel Tower" top (Fig. 16) belongs to the first type. The penny top of the shops (Fig. 17) and many other analogous ones have the axis independent. To this second type belongs also the "acrobat" top (Fig. 18), save that the axis, arrested in its revolution by a notch, takes on a rectilinear motion upon the cord or sword blade that carries it.

In the "Protean" top (Fig. 19) the glass cone that forms the top is held at the moment at which the cord is drawn by a movable axis independent of it.

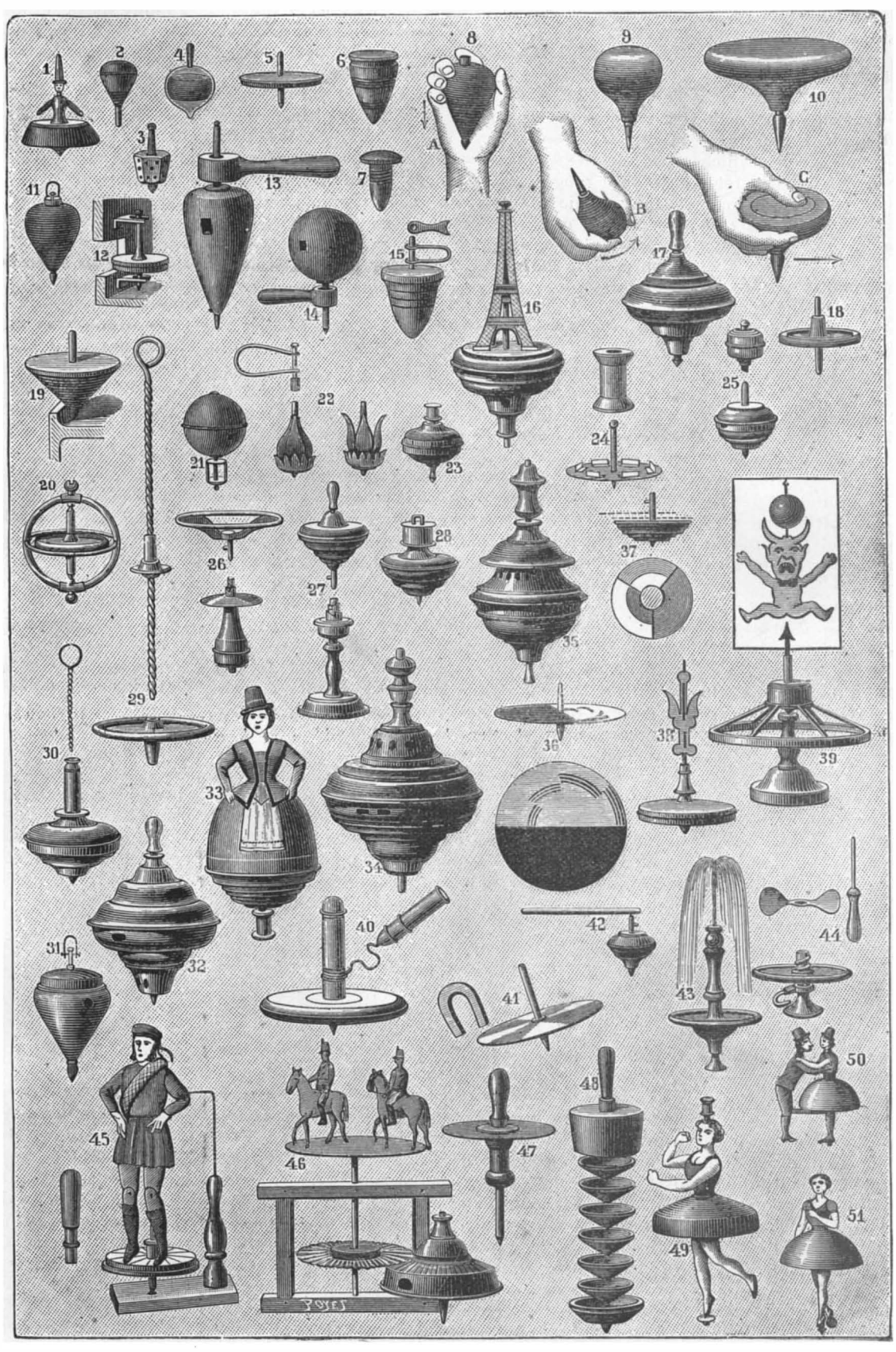
Finally, in the "gyroscope" top (Fig. 20), the rotary motion is given to the interior flywheel in holding the external ring in hand.

5. Tops of Various Systems.—The top having a to and fro motion (Fig. 21) is very ingenious. With one hand is held the small frame beneath, in which the axis turns freely, and, with the other, the cord whose extremity is fixed to the axis, and alternating rotary motions are then given the top. After the top has been set spinning, it is left to itself, when the cord winds up in the little cage, and the top revolves freely.

The "Flora" top (Fig. 22) is likewise set in motion in a peculiar way. It is mounted upon a screw thread, and takes on the motion of the upper axis, which revolves in a curved piece held in the hand. After the cord is unwound the axis is arrested, and the top unscrews and continues to spin. The petals of the fanciful flower that it represents open under the action of centrifugal force, the flower expands and then gradually closes under the action of small springs when the motion begins to slacken.

I have two air tops, one of which, called the "Æolian," is shown in Fig. 23 and the other in Fig. 24.

The spring top (Fig. 25) merits special mention on account of the simplicity of its operation. It is too well known to need a description. In a variant of it (Fig. 26) the spring is applied beneath, at the



CURIOUS TOPS.

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lower part of the axis that serves as a bearing point for the top. This latter is nothing more than a ring provided with four wings. When the spring is freed, the top rises slightly in the air, and then falls back to the ground and continues its revolutions. In another variant (Fig. 27), the spring is also beneath, but forms part of a support upon which the top is capable of continuing to revolve. I have also a spring top (Fig. 28) that is very well balanced and spins for a long time. The helix has likewise been applied to the setting of tops in motion. The "Archimedes" top (Fig. 29) is a simple disk provided with a point. A traveler forces it to descend along the helix, from which it escapes in revolving. In another top, called the "Alternative," the motion is inverse, and it is the helix that is displaced vertically (Fig. 30). The top, held in the hand by a sheath loose upon the axis, thus takes on its motion. The rack has been employed in various playthings, for setting in revolution an internal flywheel that actuates them. I know of no application thereof to tops, properly so called.

II. COMPOUND TOPS.

Many of these have been described in these pages, and I shall confine myself to mentioning them. I shall add a few words of explanation to those that are, perhaps, unknown to our readers.

1. Acoustic Tops.—Among the tops that I have arranged in the first class, all those that are hollow produce more or less acoustic effects. They whistle, sing or hum under the action of the air in the apertures with which they are provided.

Other tops have been more especially devised with a view to the production of harmonic sounds. They often have a simple play of reeds giving a single tone. In the wooden peg top (Fig. 31), a variant of No. 2, the play of reeds is at the upper part, and the spinning of the top produces a draught of air through properly arranged apertures. The same is the case in top No. 32, the cheap model of the shops. The play of reeds is here in the interior.

In model No. 33 the axis is independent of the body of the top. It carries a flywheel which is provided with wings, and that revolves in the bell shaped portion. The air is thus projected upon a diaphragm with which the shell is interdependent and which carries the play of reeds. The sound is greatly reinforced through this arrangement. In the specimen that I have preserved, the external form is that of a pleasing Tyrolean woman.

The "harmonic" or "choral" top (Fig. 34) produces changing tones. The principle of model 35 is different. The axis terminates in a sort of claw that renders it immovable, and a revolution of the top is established upon the axis that remains fixed. The latter carries a tongue that strikes a play of reeds carried by the top, and the result is an air analogous to that of the music rattles sold under the name of "rivoltellas."

2. Optical Tops.—I mention in the first place the "spectral" top (Fig. 36) serving as an advertisement to Pears soap. It is a simple cardboard disk carrying lines figured in black upon a white ground. When set in motion in a good light, the concentric circles assume the colors of the spectrum, and the order of which is reversed according to the direction of revolution.

I shall not enter into a scientific discussion of this experiment. It would require me to take up the entire theory of the vibrations of the retina under the influence of colors.

The "chameleon" top (Fig. 37) was one of the first to popularize the effects of the Helmholtz colored disks. It is a spring top. Various systems of tops, almost identical and under various denominations, independently of the colored disks, have produced new effects always due to the persistence of impressions upon the retina, through open spaces in cardboard fixed upon needles, etc. The top shown in Fig. 38 is what is called the "dazzling" top. What is called the "enchanting" top (Fig. 39) lends itself to various optical experiments. The point revolves upon a support, and, thanks to this arrangement, the rotary motion and equilibrium persist for a long time.

3. Tops Producing Magnetic Effects.—The "induction" top (Fig. 40) has already been described in these pages, as has also the "magneto-electric" one (Fig. 41). The "Sultan" top (Fig. 42) is a small one with a very light spring. After it has been set spinning there is placed near the axis a magnetized bar to the rounded end of which it adheres and continues its revolution while suspended in the air.

4. Tops Producing Dynamic Effects.—The "hydraulic" or "water jet" top is shown in Fig. 43, and the "screw spinning" top in Fig. 44. The "puppet" top (Fig. 45) consists of a disk set in revolution upon a pivot by means of a movable handle and a cord. Above is suspended a jointed puppet made of cardboard. The projecting radii of the disk strike the feet of the figure and cause it to dance a sort of jig. Fig. 46 represents the "carrousel" top. A small table carries the carrousel, upon the axis of which there is a disk provided with bristles. The top being in its equilibrium of revolution, the carrousel is placed near it, when the circular brush rubs against the striated conical portion of the top, and the carrousel enters into a rapid motion to the musical sound of the top, which is provided with a play of reeds.

5. Various Tops.—The "gyrograph" top (Fig. 47) consists of a metallic disk of some little weight elevated upon quite a long point formed of a sharpened lead pencil. The top is spun upon a sheet of paper, and, as it is difficult for it to assume a vertical equilibrium, the pencil point draws spirals upon the paper that may be varied by interfering with the top's motion.

The "stork," also called the "parachute," top (Fig. 48) is formed of a series of cones that set into one another. When the upper one is removed, after having once been set spinning, the little cones of various colors separate and revolve around it.

Next came various dancing tops, such as the "waltzer" (Fig. 50) and the "dancer" (Fig. 49). The "waltzer," shown in Fig. 51, is very graceful and of a pleasing effect. The motion is given with a single revolution of the cord upon the part forming a hollow pulley at the foot, and is transmitted to an internal flywheel. The body of the dancer is carried along through the impulsion, and every time that the roller under the second foot touches the ground there occurs a displacement of the axis and a waltz movement.—J. J., in La Nature.

### Some Shortcomings of the New Army Rifle.

Prominence has been given to reported defects in the new small arm, the modified Krag-Jörgensen gun adopted by the army ordnance office. Gen. Flagler, the army Chief of Ordnance, says the most serious defect developed by the trial of the gun in service has been the occasional rupture of the cartridge case near the head, causing an escape of gas, and interfering with the convenience and self-possession of the firer. This has been met principally by a change in the construction of the cartridge by thickening the base of the cartridge to remove the line of weakness. A good many officers complain of the inaccuracy of the sights. The principle of the present sights will not be changed, but an improvement will be effected by experimental firings at the armory to correct graduations of the sight and the fixed alignments for drift at the 500 and 1,000 yard ranges.

Many of the infantry officers have complained that the absence of a wind gage on the gun prevents as close shooting as might be obtained with it on the target range. Gen. Flagler says: "The object of all target practice is to enable the soldier to shoot better in battle. While it is obvious that the wind gage might in some cases enable the marksman on the target range to hit the bull's eye oftener, it is equally obvious that this would not train the soldier to shoot better in a battle because he cannot and will not use the wind gage in battle, except possibly in rare cases where special marksmen would shoot at an individual enemy at long range. It is much better that the soldier should be trained to use the rifle on the target range in the same condition that he will be compelled to use it in battle. Even in the exceptional case mentioned, it is probable that the soldier would obtain as good results by allowing for wind in his aim as he could by unknown and estimated distance, and it is therefore better that the soldier should be trained to make this allowance on the target range. In nearly all firing in battle such allowance is not required, because at long ranges the soldier shoots at a long, horizontal line, not at an individual enemy, and at close range, where no allowance is necessary, the sight makes allowance for drift."

Among the improvements made are the raising of the safety lock pin, the replacing of the straight cut-off spring by a coiled spring and spindle, and the discontinuance of the bluing of the parts of the bayonet, as the heat of the niter bath was found to injure the temper of the blade. Among the changes to be made are: The muzzle is to be rounded, inside and out, as on the Springfield rifle; in the cocking piece a cut will be made on the upper side, so that the safety lock may be operated to prevent the belt from turning when the arm is not loaded, desirable especially for cavalry; the stock will be lightened by two holes bored in the butt and by a cut in the barrel bed beneath the position of the sight; the hand guard will be extended further to the rear over the front portion of the receiver, to afford better protection to the hand from the heated parts. The department has encountered some difficulty in securing suitable steel for gun barrels. The manufacturers had some trouble in meeting the requirements, which had been increased in severity over the old condition for similar material. The army rifle will not be abandoned in favor of the Springfield gun, as has been reported. If any change is made, it will be made in the adoption of a still smaller caliber, although most ordnance officers maintain that the limit has been reached in the present, the 0·30 caliber rifle.

AN inch of rain falling upon an area of one square mile is equivalent to nearly 17,500,000 gallons, weighing 145,250,000 pounds, or 64,844 tons.

### Cycle Notes.

In the recent maneuvers in the French army, in which bicycles were used, both pneumatic and solid tire wheels were ridden. Out of twenty-five wheels, half were equipped with pneumatic tires and only one puncture was reported, while quite a number of the solid tired wheels had spokes broken on account of the inflexibility of the tire.

A canvass has been made by wheelmen to find out what railroads in the East transport wheels free. Among these roads are the Baltimore & Ohio, New York, Lake Erie & Western, the New York, Ontario & Western, the Delaware, Lackawanna & Western, Long Island, West Shore, Central Railroad of New Jersey and the Philadelphia & Reading.

The coming cycle show, in Madison Square Garden, New York City, which opens on January 18 and closes on the 25th, will be, beyond all doubt, the most complete exhibition of cycles and things pertaining thereto that has ever been held. In a larger sense than ever before, the show will be of great importance, as dealers and manufacturers from all parts of the country will visit it.

Bicycles have been admitted into the grounds of the exclusive Botanical Garden in Regent's Park. They must not, however, be brought near the museums and conservatories.

Dr. Conan Doyle on Cycling.—"When the spirits are low, when the day appears dark, when work becomes monotonous, when hope seems hardly worth having, just mount a bicycle and go out for a good spin down the road, without thought of anything but the ride you are taking. I have myself ridden the bicycle most during my practice as a physician and during my work in letters. In the morning or the afternoon, before or after work, as the mood o'ertakes me, I mount the wheel and am off for a spin of a few miles up or down the road from my country place. I can only speak words of praise for the bicycle, for I believe that its use is commonly beneficial and not at all detrimental to health, except in the matter of beginners who overdo it."

A paper published in Germany, called the Fahrrad Export, is a cycle trade paper with every article and advertisement printed in German, English, French, Spanish and Russian.

An electrical vulcanizer is now being introduced by a large manufacturer of bicycle tires. The vulcanizers are built of 110 volts standard incandescent current. If any other voltage is used, a transformer is necessary. It may be attached to the ordinary lamp socket by providing wires from the vulcanizer to the socket. Where proper care is exercised, any repair man of average intelligence ought to be able to make satisfactory repairs with it.

The Empress of Austria, who has a reputation as a horsewoman, now rides a bicycle.

A race was recently run in France in which no machine was entered which was not twenty years of age or more.

One of the latest bicycle sundries is a kind of hip-pocket or leather pistol case fitted close to the handle bar. So many attacks have been made upon wheelmen, even upon the well-traveled roads of New Jersey and Long Island, that many of them are now carrying revolvers.

Cyclists should see that their shoe laces are fastened before mounting a machine; for, as in skating, a loose lace may cause a bad fall.

Tricycles are becoming very popular in the French capital for winter riding, and many French cycling firms are making a specialty of the tricycle for winter use.

The Coney Island cycle path has now been lighted throughout with electric light, so that many riders are now enabled to make the trip who could not otherwise have done so. The path continues to be well patronized by riders, and the Shelter House, at the Coney Island end of the path, has been inclosed in glass, and it is heated by stoves.

During the recent strike of the trolley car men in Philadelphia few cared to ride in the heavily guarded cars which were run. All the bicycles in the city were put into requisition, and the wheelmen had a decided advantage over their brethren.

The street railway company of a Western city has resolved to suspend the running of the horse cars, owing to the fact that the bicycle has diminished their profits.

Wood tubing is now being made in small quantities; only one wheel has now been built with it. Nearly two pounds of weight will be saved in every frame. It is impossible to break or buckle the wood without enormous strain. It is also impervious to water, and is not affected by heat or cold. A steel joint has been devised which is as reliable as the brazed joint of a steel frame. Of course, the supply of the raw material is inexhaustible. The tubing is made up of a number of sections of wood fastened together.

A sextuplet has been seen on the streets of Paris. It was built for track use. It weighs 150 pounds and is six and one-half yards in length.

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## THE LIGHT DRAUGHT COMPOSITE GUNBOATS.

(Continued from first page.)

The vessel once in motion, the weight of any marine growth, assisted by the characteristic exfoliation of the copper plating, would cause its release, and in this very simple natural evolution we have a means of making these vessels more extensively independent of coal piles and docking facilities than their sister ships, while assuring them a much more extended radius of action—limited in the twin screw boats to the possibilities upon their coal supply, measured in the single screw, sail-powered boats principally by a matter of provender, for the spread of 11,165 square feet of canvas is deemed sufficient to assure a sailing speed equal to that of the best steaming conditions.

## THE NEW TORPEDO BOATS.

A second triple addition to the mosquito fleet of the United States navy has been provided for in the act of Congress of March 2, 1895, appropriating for the construction of torpedo boats Nos. 6, 7 and 8, the individual cost of which, including governmental superintendence, preparation of plans, and the provision and installation of ordnance outfit must not exceed $175,000—a moderate allowance, which, but for present prices and skillful management of design, would be impracticable.

With the completion of these and the three other boats authorized in 1894, the service will be possessed of eight craft of this order, representing four periods of constructive and engineering progression within the past six years. Of their kind, that of torpedo boats pure and simple, the new vessels will be the largest in the world and unexcelled by those of any other nation, while in point of speed and weatherliness they will closely approach the more formidable torpedo boat catcher—features demanded by our broken coast line.

With a displacement of 180 tons, they will be 170 feet between perpendiculars, with an extreme water line beam of 17 feet upon a mean, normal draught of 5 feet 6 inches. The hulls are models of the most recent practice; with an easy razor-like entrance and a long fine run below water toward the screws. The "tumble-home," which begins just forward of the midship section, increases afterward, where it broadens out over the propellers, giving a very full water line area of shallow draught. This flat form of stern prevents the settling so common to torpedo boats under full power, while holding to the water in all conditions of weather and preventing racing of the screws.

The boats will be built of steel. The armament will consist of three 18 inch torpedo tubes on swivel mounts and of four 1 pounder rapid-fire guns. Six hundred rounds of ammunition will be allowed for the guns, while four automobile torpedoes—the type yet undetermined—will be provided; the spare one being carried in a steel stowing case on the starboard beam. The torpedo discharges will be arranged on the main deck, two forward and one aft, the forward tubes being placed slightly en echelon, admitting of considerable athwartship fire in addition to the extended field of action of each on its own side. The after discharge will be on the center line, and will have an unhampered sweep of 280 degrees. This emplacement is devoid of "dead angles," and gives an all-around discharge of great scope.

The conning towers, of which there are two, will be near the bow and the stern, each about 35 feet from its respective end. Hand steering gear will supplement in the forward tower the steam mechanism common to both towers, affording one more chance in case of mechanical failure.

The forward tower will be surmounted by one of the 1 pounder guns, to be worked from a gallery on the after side. The three others will be mounted along the sides, two on the port and one on the starboard.

The freeboard forward is carried up to a height of 12 feet 6 inches, adding materially to the sea-going qualities of the boats while yielding increased berthing space for the crew and a housing for some of the forward mechanisms.

So important is speed in this type of craft that fifty per cent of the total displacement will be absorbed by the boilers, engines and appurtenances, and the magnitude of this amount may best be appreciated when it is known that this allowance is just double that for the motive mechanism of the commerce destroyers Columbia and Minneapolis.

The engines, which are of the triple expansion sort, each in its own water-tight compartment and actuating a separate screw, are very fine examples of power and compactness, beautifully balanced, with a very nice distribution and division of weights. With a common stroke of 18 inches, impelled by steam at a pressure of 250 pounds to the square inch, supplied by three water tube boilers that flank the engine space—two forward and one aft—the two 6 foot manganese bronze screws will be driven by the engines at the rate of 395 turns a minute, developing an indicated horse power of 3,200, and driving the boats through the water at a speed of 26 knots an hour.

The normal coal supply will be 12 tons, with a total bunker capacity of 60.

There will be no search lights, but the boats will be lighted by electricity; and natural ventilation will be ample to insure comfort under all conditions of service. Folding boats will be carried.

The officers will be aft, while the crew will be provided for in the forecastle and just below on the berth deck. Excepting the captain and engineer, who will have separate state rooms and bunks, the two other officers, the four machinists, and the sixteen seamen, each in a common country, will sleep in folding berths, easily turned out of the way to afford added space and comfort when not in use.

No premiums are offered for increased speed, and, with the well-known governmental margin of safety, the penalties for decreased speed need not be feared; while even a more excellent performance may reasonably be hoped for.

One boat will be built by Moran Brothers Company, of Seattle, Washington, for $163,350, and the two others will be built by the Herreshoff Manufacturing Company, of Bristol, R. I., for $144,000 apiece.

### Science Notes.

Anthion.—The Chemische Fabrik, of Berlin, says the Revue Universelle, has recently put upon the market an oxidizing substance, the properties of which have been long known to chemists. It is the persulphate of potassa, and is prepared by electrolysis in submitting a solution of sulphate of potassa to an electric current. There occurs an oxidation and a deposit, at the positive electrode, of the persulphate, which is, in fact, less soluble than the ordinary sulphate, while hydrogen is disengaged at the negative electrode.

There is obtained a very light precipitate which readily crystallizes through solution in warm water, and which in cooling yields brilliant crystals having a reflection comparable to that of mother-of-pearl. These crystals are sold by the Berlin works under the name of "anthion." This substance, like all bodies whose stability is not perfect, is a remarkable oxidizing agent either in neutral or slightly alkaline solution.

It is employed in dyeing and serves for decolorizing indigo and various other substances. It is also used for bleaching fabrics. But its greatest utility, without doubt, is the application that can be made of its properties in photography. The difficulty of removing the hyposulphite of soda in excess that has served to fix photographic images is well known. However prolonged be the washing, a certain quantity of the hypo always remains, and it is precisely this salt that gradually, in time, deteriorates the best prints.

Anthion exerts its oxidizing action upon the hyposulphite with advantage, and, abandoning its oxygen to the profit thereof, converts it into tetrathionate. The modus operandi is simple. A preliminary washing is done as usual in order to remove the greater part of the hyposulphite of soda. The negatives are afterward immersed for a few minutes in a solution containing no more than a half per cent of anthion, and all that remains of the hyposulphite is converted into tetrathionate, that is to say, into a substance that is no longer a reducing agent.

Solidified Gelatine.—Gelatine possesses the curious property of becoming insoluble in contact with formic aldehyde, and, at the same time, of preserving perfect transparency. Gelatine rendered insoluble, or "petrified," to use a more appropriate term, resists water, acids, and alkalies. It resembles celluloid, but has the great advantage over the latter of not being inflammable.

We have here, then, a new product very easy to obtain, possessing interesting properties and destined to play an important role in the industries.

The gelatine used is the ordinary article found in commerce. The formic aldehyde is what is commonly called "formol," "formaline," and "tannaline." The commercial product is a 40 per cent solution of formic aldehyde in water. It is a colorless, sirupy liquid of a pungent odor. The vapor is not inflammable, and it is a powerful antiseptic.

In order to obtain moulds of statuettes, etc., we take, for example, two pounds of good white gelatine and steep it in a quart of water for a night. The next day the whole is melted over a water bath. For delicate mouldings, the solution is diluted with a little water.

The mould, which may be made of plaster, clay, or metal, having been prepared, the formic aldehyde is poured into the melted and slightly cooled gelatine. The whole is well stirred with a wooden spatula in order to obtain a homogeneous mixture. The latter is then poured into the mould and allowed to cool. After the object is taken from the mould it is finished by immersing it for a few instants in a concentrated solution of formic aldehyde, or, if it is too large for immersion in the solution, its surface is painted therewith. Unfortunately, objects obtained with the gelatine alone are transparent and resemble glass.

By previously adding to the gelatine some finely sifted zinc white mixed with a little water and alcohol, and in operating in the same way, beautiful imitations of white marble may be obtained.

By mixing the oxide of zinc with appropriate colors, objects of all shades may be obtained, and, by properly arranging the colors, veins, striæ, spots, etc., may likewise be produced. The solidified gelatine may be used for imitating mother-of-pearl, tortoiseshell, amber, coral, etc., and for the manufacture of toys and artificial flowers.

Antinonine.—The large manufacturers of colors in Germany are paying more and more attention to the production of antiseptics, and a French exchange mentions in this line a new product obtained from such manufacture, viz., potassium orthodinitrocresolate, which, it would appear, is destined to render great services.

Messrs. Harz & Miller have published in the Münchener Allgemeine Zeitung an account of their experiments with this new compound, which they call by the more practical name of "antinonine." A solution of 1 part to from 1,500 to 2,000 parts of soapsuds assures the destruction of all the ordinary vegetable parasites without injury to the plants. On another hand, Mr. Aubry, superintendent of the Experimental Brewing Station at Munich, has found that antinonine permits of preserving yeast for a long time, and which, without such treatment, rapidly decomposes. The yeast, moreover, does not lose its power of producing fermentation, even when very concentrated solutions of antinonine are used, say 15 parts to 100. The new antiseptic is inodorous and of a relatively low price.

Argon Thermometers.—Mr. W. R. Quinan, in a recent paper, dwells upon the advantages offered by argon as a mono-atomic gas, in the manufacture of high temperature thermometers, over the hydrogen and nitrogen generally employed. It remains for physicists to study Mr. Quinan's proposition.

Electricity in the Manufacture of Wine.—The Italian vintagers, says the Electricien, are congratulating themselves upon the use of electricity in the manufacture of wines. Through such an application it is possible to modify the bouquet and the very nature of the crop, and also to correct the effects that are so apparent in the California wines, which are much too heavily charged on account of the richness of the soil. But the value of electricity in the wine making industry does not end here. In an Algerian establishment in which the work of the Arabs is uncertain and not very satisfactory, there has been installed a complete electric plant, which takes charge of the whole business. By means of a steam engine and a dynamo, there is effected, in the first place, the lighting of the wine presses, and the current actuates in addition seven motors, of from two to ten horse power each. One of these motors actuates a sort of dredger, which gathers up the bunches of grapes piled up on the ground and deposits them in the presses. The latter are set in motion by three other motors. As for the other motors, they are directly coupled to centrifugal pumps which tun the wine.

Kauri Wood Pavements.—An experimental wooden pavement has recently been laid in one of the streets of this city. The material is kauri wood, the product of a dense West Australian conifer, the Dammara Australis. The blocks, $3 \times 4 \times 9$ inches, are sawed in Australia and sent hither by boat. The wood is exceedingly heavy, reddish in color, and resinous in odor. The blocks are laid in a bed of molten pitch, superimposed upon an ordinary concrete foundation. The final surface is gravel and cement.

This kind of pavement has not hitherto been laid in the United States, though it is considerably used in Europe, and Piccadilly in London is paved with it. The experimental pavement has been laid with the hope that its excellency shall lead to its substitution for asphalt in the avenues now paved with that material. The agent of the Australian contractor asserts that the blocks of kauri wood can be worn down to one-sixteenth of an inch before they need to be removed, and says that his principal is ready to pave Fifth Avenue with this material and guarantee it for fifteen years.

A New Nitrated Fertilizer.—Mr. Camille Faure recently made known to the French Academy the discovery, due to the development of the electric arts, of a new nitrated fertilizer adapted for agriculture on a large scale and remarkably cheap. It is a question of cyanate of calcium, $Ca(CA_2O)_2$, which, up to the present, has existed in small quantities only in laboratories, and which has suddenly become a very important substitute for the nitrate of soda that is imported at great expense from foreign countries. It is even richer than the soda in assimilable nitrate. As cyanate of calcium is an oxidized substance, it does not necessitate the use of a great amount of heat in its production. All the manufacturing operations are performed in one and the same electric furnace, in which a mixture of limestone and coal is submitted successively to a direct preliminary heating at 1,500° C., and afterward to an electric superheating at 2,500° C., in the presence of pure nitrogen in large excess, and finally to an oxidation by the air, the oxygen of which is retained by the product, while the nitrogen carries the heat due to oxidation to the electric chamber.

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## THE INVENTIONS OF ALFRED ELY BEACH.

The biography of Alfred Ely Beach which appeared in our last issue described the busy life of one who figured as an inventor, engineer, and editor, filling each role with equal credit. To those who knew him, to those who have benefited by his work in the editorial chair, and to the younger generation who have the world's work pressing more and more heavily upon them, a description of some of his inventions will be welcome and inspiring.

We have stated that as an inventor he committed the error of being two decades ahead of his generation, and when we go back to the old records of his work, it is interesting to see how much he did years ago in the fields of mechanics and of engineering which only to-day is being adequately used and exploited.

Mr. Beach is widely known as one of the early inventors of a typewriter, and his machine of forty years ago shows many of the points of the present accepted type of instrument, notably the basket or pot arrangement of the type rods. His idea in producing this machine was to enable the blind to print works and communications in embossed letters for their own use. This gave him a very difficult problem to solve, that of causing a male and a female die to meet accurately with the paper between them, so as to emboss letters thereon on the same plan as that followed for notary seals. A great point is made about the alignment of the modern typewriter, but the problem of securing correct alignment is simple compared to that of making the two embossing dies of the Beach typewriter meet with requisite accuracy. We illustrate the original Beach typewriter, and would call our readers' attention in its construction to the features since developed and used in the modern typewriter. In the center we have the familiar "pot" or "basket" formed by the type rods. The lower set of type bars in action have one by one their ends carrying one kind of die thrown up, and simultaneously the corresponding die of the upper set is thrown down, and the two by mutual impact, like two fingers, emboss the paper as it is fed between them.

This machine dates back to 1856 and has been aptly characterized in the history of the typewriter as "the first device of any sort in the way of positive improvement." As a mechanical movement the action of the two sets of type bars is very interesting. A fuller account will be found in our SUPPLEMENT No. 574. While 1856 is the date of the public exhibition of this machine, Mr. Beach had attacked the problem in 1847, producing then a typewriter embodying many of the principles of the machine of to-day.

The subject of street car traction occupied him next, and thirty years ago he invented cable traction systems. During the last years of his life the constant passage of the Broadway cable cars in front of the offices of the SCIENTIFIC AMERICAN showed him in some sense the fruition of his early work.

Our next illustration shows some features of the pneumatic mail system, by which Mr. Beach hoped to be able to collect by machinery the letters from the mail boxes of the city. He proposed to establish underground a system of pneumatic tubes, traversed by cars which would fit the tubes with comparative tightness and through these tubes he proposed to drive the cars by the pressure of air urged by blowers. The idea to-day is so feasible that it really seems as if there was nothing to stop its successful application.

Mr. Beach proposed the widest possible extension of this system, and it is quite within the probabilities that some analogous process of collecting the mails may yet be adopted in this city to do away with our present slow method.

We present in these illustrations, made years ago under his own direct supervision, the system so clearly that but little description is needed.

The letters and packages were to be delivered to cars from revolving hoppers whose revolution was effected by pins on the edges of the cars striking the vanes. In one of the cuts the official is shown distributing letters into the hoppers, which transfer them to compartments in the car below. By removing the striking pins a car could be sent through without making collections. Delivery was effected by tripping the hinged bottom of the car, also by a striking pin. To receive cars coming out of the tubes, air cushions were provided.

A receiving and delivering station is shown under the old Lovejoy's Hotel on Park Row. The tube is seen crossing the basement near its ceiling. Six receiving hoppers lead into it from the first or ground floor, and a delivery hopper projects from its bottom. Instead of lamp post boxes, hoppers were provided, automatic in operation, whence letters were collected by the passing cars.

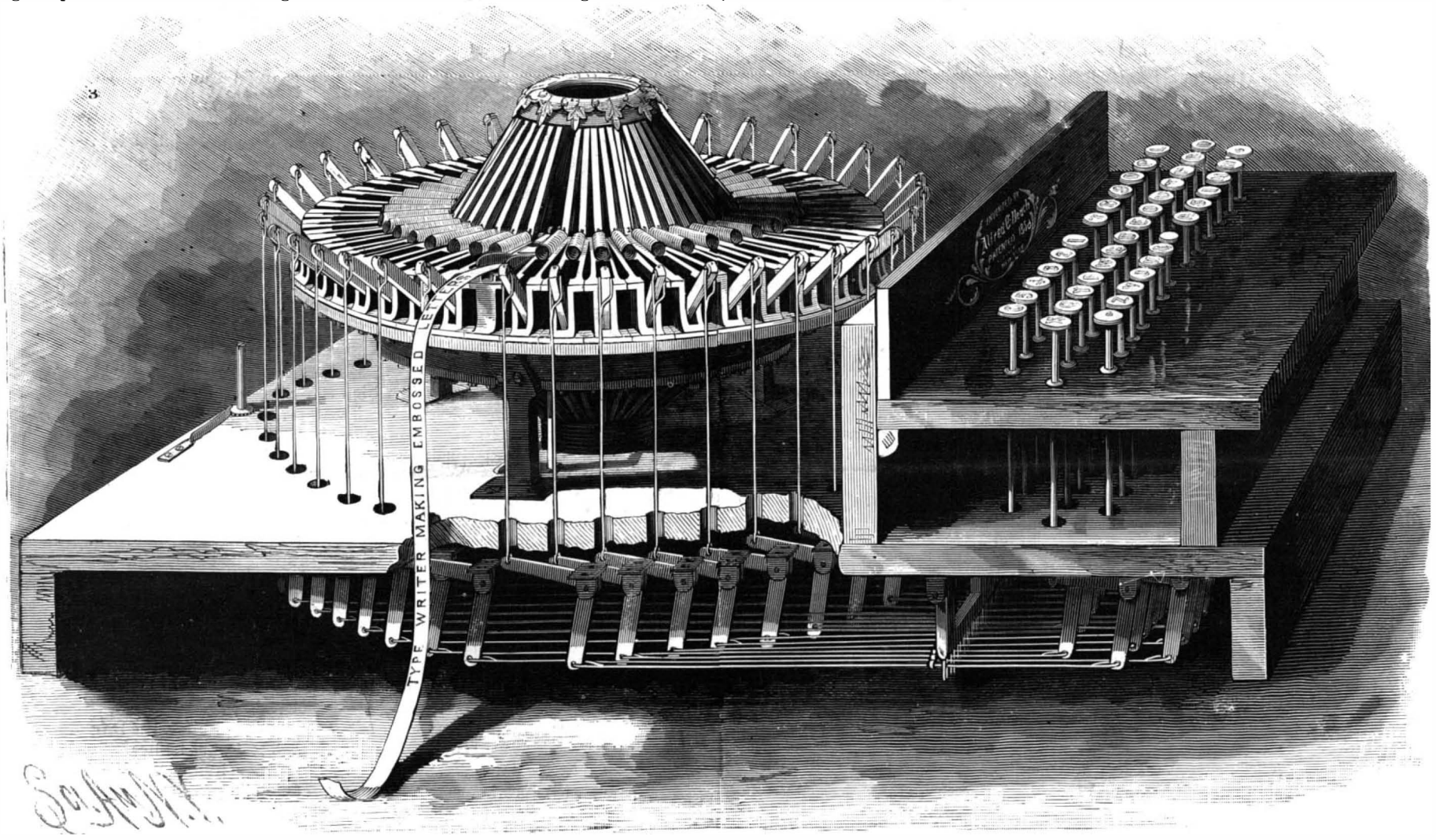
Subsequently, in 1870, he built, in the basement of the building at 260 Broadway, a section of iron pipe eight inches in diameter and about a thousand feet long, which was highly glazed inside to form a perfectly smooth surface. One end of the pipe terminated in a large box, from which a second pipe led to the exhaust pipe. As the air was exhausted from the box, a strong current was carried through the pipe. If a letter or small piece of paper was dropped into the pipe, the current of air carried it freely and certainly to the receiving box. This was made very large, and, as there was no current there, the letters would invariably drop to the bottom, and, by a system of double doors, were easily removed. The simplicity of the idea was its noteworthy feature. Hundreds of experiments were tried, resulting successfully in the transmission of the letters.

Mr. Beach also designed an endless canvas trough to be carried along like the present cable system through a tube under street lamp posts, and thereby become a continuous means of communication from the street post to the post office.

Another interesting illustration shows the pneumatic system applied to an elevated railway. The tubes were to be of wood. On one side of the street the elevated way is carried on columns, on the other it is supported by brackets attached to the wall of the building. Here we have one of the first presentations of an electric road erected on the lines of the present structures. It is curious to note that the first of the New York elevated roads was carried by a single row of columns central to the track, just as shown in this old illustration of the Beach elevated road.

These illustrations of the pneumatic system with descriptions were published as early as 1867, the year of the public exhibition of the system at the fair of the American Institute.

We have seen that Mr. Beach was not content to stop at pneumatic transportation on the small scale demanded by the conveyance of letters, and that he conceived the bold idea of extending the invention to the transportation of people, believing that it was practicable to construct a large tube and to blow cars through it at high speed, the cars carrying passengers or merchandise. Visitors to the American Institute Fair, held in the old Fourteenth Street Armory, in the city, in 1867, will remember the pneumatic railroad suspended from the roof and running from Fourteenth to Fifteenth Streets, which is shown in one of our cuts. During the progress of the fair this railroad was kept in constant operation, and carried, it is safe to say, thousands of people.




THE ORIGINAL TYPEWRITING MACHINE, FOR WHICH THE GOLD MEDAL OF THE AMERICAN INSTITUTE WAS AWARDED IN 1856.

The tube, 1½ inches thick, was made of wood in fifteen layers, glued together. It was 6 feet in diameter and 107 feet long. The car, which was open at the top, could carry ten people. A helix fan, 10 feet in diameter and 12 inches pitch, making 200 revolutions per minute, propelled the cars. The car fitted the tunnel approximately, the windage not being sufficient to interfere noticeably with its action.

The New York Tribune, in outlining the great project of providing the city and environs with pneumatic dispatch tubes for mail, says that "letters might be sent up town as high as Forty-second Street and replies received almost with the speed of telegraphic messages." This describes almost exactly what is now done in Paris, New York and elsewhere, where pneumatic dispatch rivals the telegraph in speed.

The next thing was to try this railroad on a practical scale, and Broadway was selected as the field of operation, where, by the use of the Beach shield, of which more will be said later, a circular tunnel was driven under the street without disturbance of the pavement and without the knowledge of those who daily traversed the ground above the scene of operation. A tunnel some two hundred feet long, circular in section and eight feet in diameter, was made, was equipped with a comfortable car, and in the basement of the building on the corner of Warren Street and Broadway was installed an immense rotary blower. The blower was kept in rotation in one direction always, and by shifting the valves was caused to act alternately as a blower or as an exhauster, driving the

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car back and forth in the tunnel. Electric signals were provided to notify the engineer of the time for changing the valves. An annular space or windage of about an inch across existed between the car and tunnel. The curved entrance to the tunnel was built of cast iron plates, the rest was of brick.

Hundreds of trips up and down this experimental line were made by the car, it being proved that the system of tunneling was a complete success and that the direct pneumatic propulsion of a car in such a tunnel could be practically effected. The system of railroad, however, never reached a more extended development than this.

The tunnel and shield are still there undisturbed for over twenty-five years.

It is curious to note that the enormous development of pneumatic transportation in this and other cities, on the line of Mr. Beach's work, has taken the direction, not of increasing but of diminishing the size of conduit. Stores and cities are now served by pneumatic conveyance for small packages and letters and similar purposes by means of tubes but a few inches in diameter. In New York, Paris and other cities, a very large development has been given to the pneumatic system for the transmission of special messages, and by using very light cylindrical boxes and restricting the system to the transmission of very light objects, cars have been entirely dispensed with, the friction between the box and tube not being sufficient to prevent the system from operating.

Comparatively few people realize that Broadway is now traversed by pneumatic tubes for the sending of telegraphic dispatches. The extensive use of the system in dry goods stores is more familiar.

In Philadelphia the system of the pneumatic dispatch has been very highly developed and applied in the postal service, and the ideas of Mr. Beach can there be seen carried out to their logical development.

TACOMA claims the Pacific coast record for the output of its lumber mills during 1895, the total being about 115,000,000 feet.

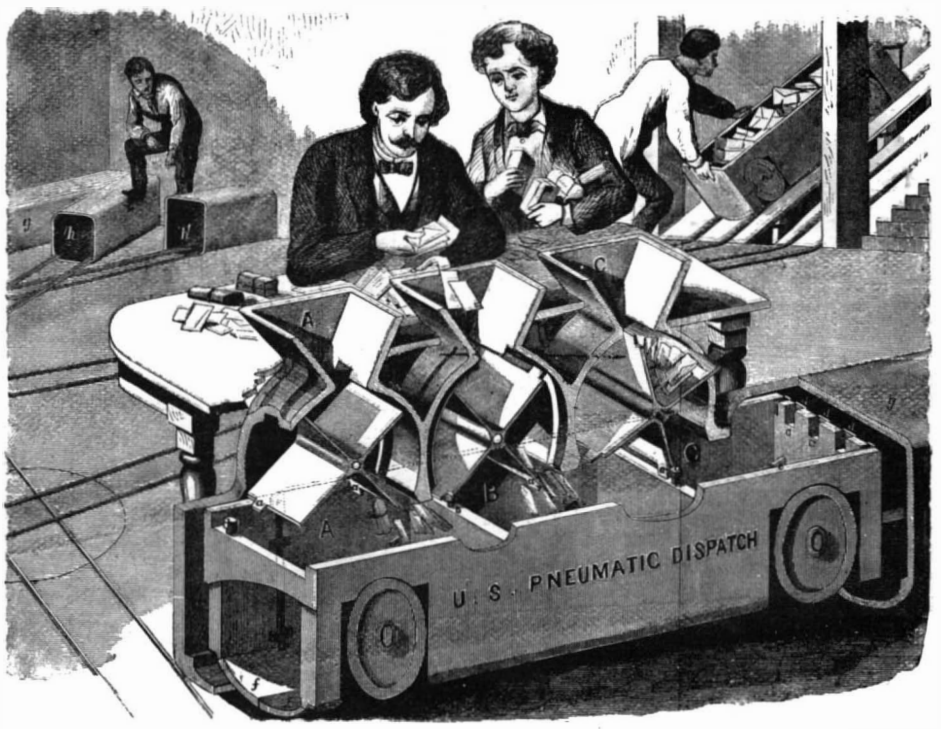
### Close of the Atlanta Exposition.

The Atlanta Exposition closed on December 31, 1895, and the exhibits are now being rapidly removed. The chairman of the finance committee states that when all the debts are paid, the exposition will cost about $200,000, or less than 10 per cent of the money expended on the fair. This includes the original stock subscription and the appropriation of the city. This result is regarded as highly satisfactory. It is estimated that the immediate advantage to Atlanta in the money expended here by the exposition visitors amounts to $5,000,000, and that the ultimate benefits to the city and cotton States are immeasurably beyond this or any other conservative figure which could be made. Some of the State buildings have been purchased for club houses and other purposes.

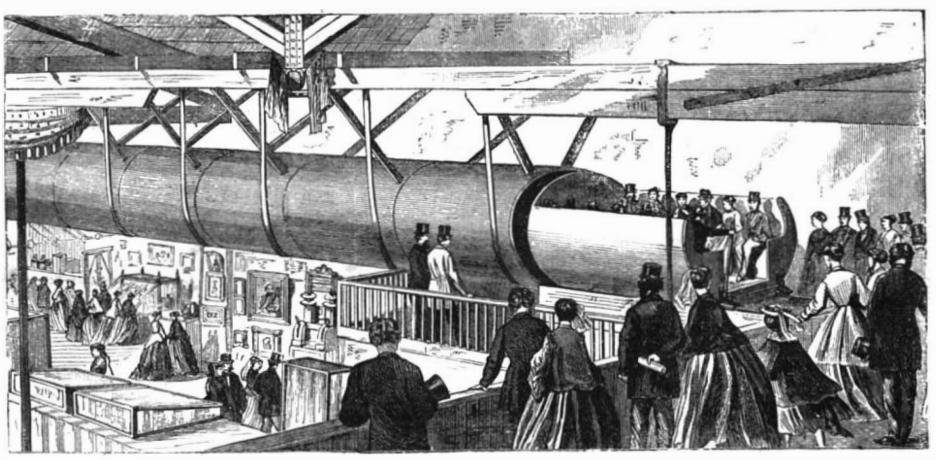
### New Hampshire Earthquake.

An earthquake of sufficient force to awaken people from sound sleep and shake buildings was felt at Hanover, N. H., at 4 o'clock, January 6.

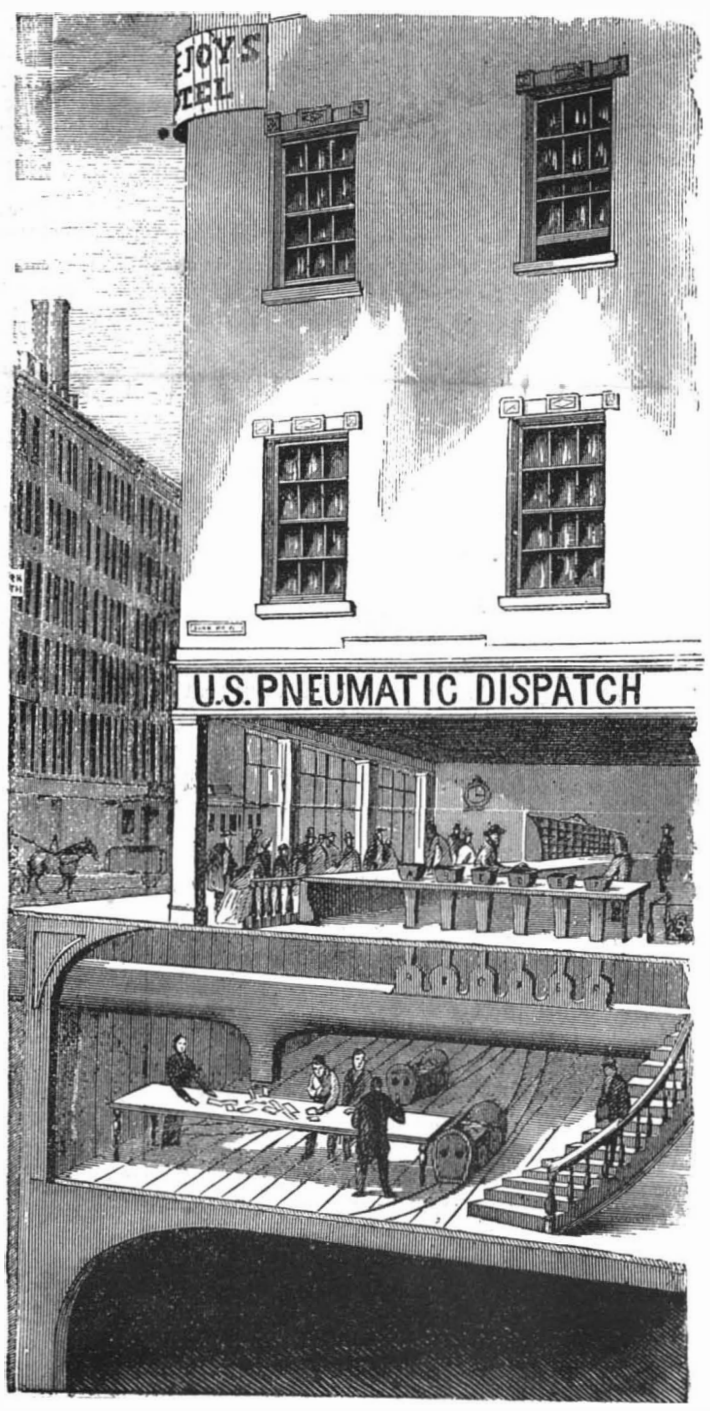
AUTOMATIC POSTAL DELIVERY BOX.



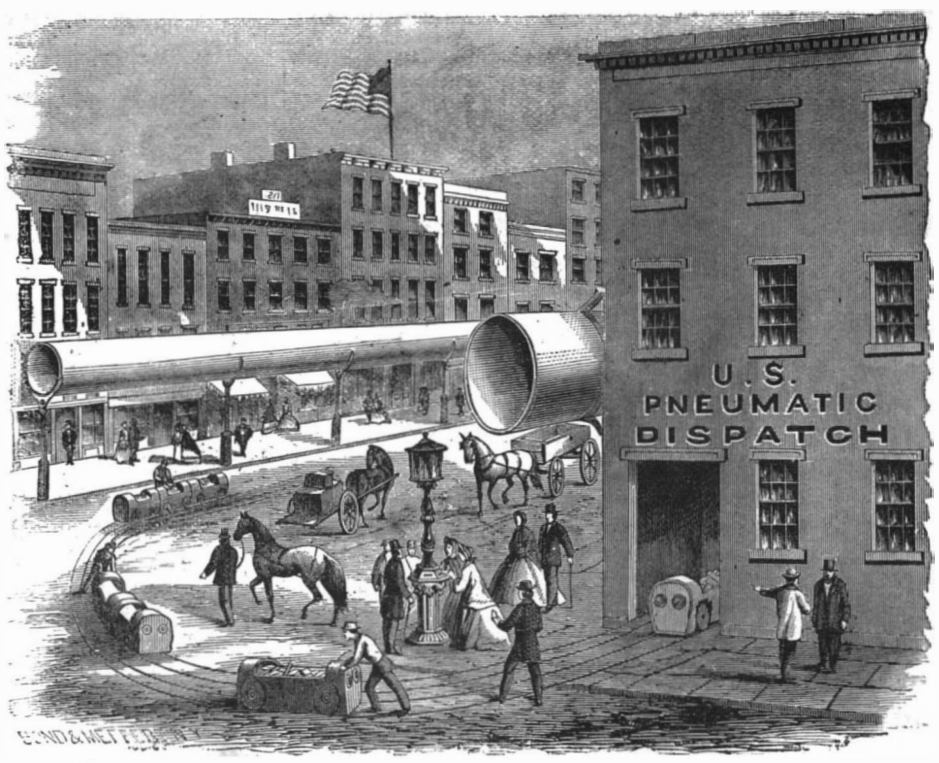

DISPATCHING LETTERS FOR A BRANCH STATION.



HE PNEUMATIC RAILWAY AS EXHIBITED AT THE AMERICAN INSTITUTE FAIR IN 1867.




RECEIVING AND DELIVERY STATION OF THE PNEUMATIC POSTAL SERVICE.




THE PNEUMATIC ELEVATED RAILWAY DESIGNED BY MR. BEACH IN 1867.

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## Correspondence.

### Improved Packages Wanted for Honey.

To the Editor of the SCIENTIFIC AMERICAN:

I write this to enlist inventors, if possible, in a new field for the exercise of their genius.

I am a honey producer, and I find that there has been but little improvement made in placing our honey upon the market in new and popular packages.

We have our little pound packages of comb honey, which are desirable and can scarcely be improved.

But a greater portion of our California honey is thrown from the comb with the centrifugal honey extractor, and is shipped in liquid form in 60 lb. tin cans to Eastern and foreign markets.

It is safe to say there is no natural food product that has so much nutriment and healthful properties in so compact form as honey. Honey caters to the taste of all classes and conditions. Still, there are multitudes of people who never get a taste of this desirable sweet.

The sirup of the sugar cane can be manufactured in various grades of sirups, sugars, and into confections a very multitude. Liquid honey, on the contrary, has never advanced beyond the tin can, the glass jar, or the jelly tumbler. The reason is found in the fact that there are difficulties connected with the manipulation of honey that are not encountered in the manufacture of the various products from cane juice. If heat up to the degree of boiling water is applied to honey, its flavor is destroyed, and the color of even the whitest honey is rendered dark and unattractive; therefore, a great degree of heat is not to be entertained.

Nearly all pure honey granulates, or candies, as bee keepers express it. This is a molecular change, and a gentle heat restores it to liquid form. In its candied state, it never gets beyond a plastic, salvy condition; and when it candies in a glass jar, it has the appearance of lard, which is detrimental to its sale.

Honey candies in a low temperature. Suppose the temperature that surrounds the honey were carried to that degree known only in experimental purposes, would it have any further molecular effect? Or again, many liquids are solidified under enormous pressure. What would be the effect upon honey? If it could be solidified by these or any other methods, aside from heat, honey could come into competition with the confections made of other substances. There is no record that these experiments have ever been tried upon our product.

If honey cannot be solidified, still there is a chance to give it to the public in a small, popular package that partakes of the nature of a confection. Our ideas for such a package naturally turn toward glass or tin. But glass is too fragile and too expensive; tin too expensive, and having the additional feature of a baking powder can or pill box. If not too expensive, a gelatine capsule of unique form, and large enough to hold a few ounces of honey, to be sold for a nickel or a dime, would come nearest to an ideal honey confection.

Inventors from the above can gather what is needed, and may be able to aid a large and growing industry. There is another quality in honey that also calls for experiment, and that is, the elimination of the coloring pigment in our darker grades of honey. Water-white honey, such as comes from our wild sages, is most attractive for table use, while the darker grades are relegated to manufacturing purposes. If by some process of filtration, all dark honey could be reduced to a lighter shade, the value would be enhanced.

If inventors desire to experiment, honey can be obtained in the leading grocery stores of almost any city. It is advisable, however, to avoid the liquid that is put up in jars and tumblers, and purchase only comb honey and drain it, or procure the honey direct from some local producer.

With the above suggestions, I trust our inventors can devise something that will aid an important industry.

J. H. MARTIN.

Sec. Cal. Bee Keepers' Ass'n, Bloomington, Cal.

### The Non-Refillable Bottle Question.

To the Editor of the SCIENTIFIC AMERICAN:

In an editorial of the SCIENTIFIC AMERICAN of November 30, you refer to the desirability of a non-refillable bottle and quote the conclusion of a prominent firm to the effect that, granted such a bottle is invented, it is still possible and probable its object would be defeated by boring a hole in the bottle and thus refilling it and the hole closed and concealed.

To my knowledge there are hundreds of devices invented to accomplish this object, and inventive minds are at this hour still working on this problem.

It is but fair, since the original suggestion of the desirability of such an invention emanated as a result of the loss experienced by distillers and bottlers, and who may be said to have "fathered" the idea, that a discussion of the requirements and objections pertaining to such an invention be conducted through the columns of your admirable paper with a view that a true idea may be had of the conditions which such a device must fulfill.

There are nearly three hundred patents on devices to accomplish this purpose, and the fact that none have been adopted is very conclusive proof that none are suitable and shows that the conditions to be fulfilled are not clearly understood by the inventor.

On the other hand, there is reason to believe there does not exist a unanimous opinion, either as to the requisite conditions, or even to the commercial value of such an invention among those who would reasonably be expected to adopt it.

It is quite impossible to discuss the construction of the device, as that lies with the inventor himself, but we may state certain conditions, and, in advancing my views, which I do in all humility and with no idea of presumption, I do so hoping that it may tend, by a free criticism of my opinions, to develop certain conditions to which the inventor may look as a guide in his work and which may be unanimously accepted as embodying the requisite features adaptable to the purposes desired. If a recognized standard is once obtained, it will be a most important step.

First, it must be composed of material unaffected by the contents, and this will exclude all such metals as aluminum, brass, etc.

It may be of glass or of mica, as only hydrofluoric acid affects either, and here let me say that that fact might be urged as an objection parallel to the boring idea.

Secondly, the working parts must be protected from the insertion of a wire, etc., to prevent possible tampering with the same.

Thirdly, it must be commercially strong and durable.

Fourthly, it must be cheap.

Now, as to its insertion into the bottle, cements are objectionable, on account of their solubility and inconvenience in handling during bottling. It must be arranged so that it is quite as easy to insert the device as to cork it.

Let us see what tests it must successfully withstand:

First, the egress of the liquid must be free, and the freer the better, but if not free enough, it is a decided objection.

Second, shaking the liquid into the bottle must be impossible.

Third, refilling by submersion in free liquid impossible.

Fourth, refilling with the bottle in any position by severe pressure or exhaust or pressure and exhaust alternately impossible.

Such are the conditions which are to be sought and attained by the inventor as to its practicability.

In view of the extent of the subject, it may be better if I withhold other features of secondary importance in the device affecting its value and adaptation by the trade for some other time.

The point I wish to make, however, is that the question is of vital importance to many struggling inventors, and that a proper discussion of this subject will tend to show from now on that it is of the greatest importance to them and the accomplishment of their task that certain conditions are to be recognized by them, and that these conditions be universally acknowledged and accepted uniformly by the trade.

In this way many an inventor will be spared the embarrassment of probable loss by knowing that his device is fatally deficient in some respect.

If the conclusion of your correspondent is correct, which we hope to show it is not, the sooner it is known the better.

I trust you will kindly conclude to publish this, and, if desired later on, I shall have further to say. I would respectfully request my name should not be published, but, if desired, you may use my initials.

Brooklyn, November 29, 1895. J. C. G.

[Most of the points of our correspondent are well taken, and we hope that his letter will lead to a successful solution of the problem. We do not regard the safety bottle in the light of a "chimera," but we think too many inventors have failed to actually make an experiment with bottles made for use. A working model in a case of this kind seems to be desirable for purposes of experimentation. We believe our correspondent is mistaken in regard to the number of patents issued, as we understand that there are only about a hundred patents that belong to this particular class.—ED.]

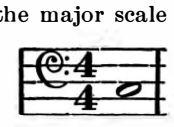
### Qualifications of a Nurse.

A physician, in speaking of the qualifications of a nurse to a Pittsburg Dispatch reporter, said, among other things, that she ought to have her five senses, sight, hearing, feeling, smell, taste, in a healthy, active condition. Sight, that she may be able to read directions or read aloud to the patient, and watch the change of countenance. A quick sighted nurse will not need to wait until the sufferer has asked for anything in words. She will, from the motion of an eye, or the lips, or a finger, all in a moment know what is wanted. Hearing, that she may catch the faintest whisper, and not oblige the weak patient to exert the voice, and to repeat every request. Feeling, that she may detect any change in the heat or dryness of the skin of the patient, and not use any application which will either scald or heat or cause a chill with cold. Smell, that she may detect the least impurity in the atmosphere of the room, or in giving medicine, notice if there be any mistake. Taste, that she may not offer food unfit to be used, or good in itself, but cooked in such a way as to be disgusting to the patient. She should be an experienced cook, so as to prepare such food as the patient requires.

### How to Find the Keynote of Auditoriums.

In an article in the American Journal of Science Dr. Ephraim Cutter gives the following directions for ascertaining the key note of auditoriums.

I. Sing the major scale of

C  or

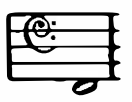
=100 m, in a rostrum position facing the audience or empty auditorium. Use care to sing each note with the same power; that is, with a medium voice uniformly as to loudness. Then observe which note is more resonant than any other note (only, if the observer sings, let him or her not get excited). This note is the keynote. Test by singing this note near a piano with damper raised. If the piano answers back better to this note than any other note (for the chords and overtones will be heard), it is the keynote.

Tune an instrument of the violin family so that one of the open strings will be in the supposed keynote; then sing it and the instrument will respond audibly.

II. If an organ is present play the scale of C natural on the pedal diapason alone, giving each note an equal force. Observe which note is most resonant and this note will be the "keynote," to be tested as above.

III. Or play this C major scale on an open piano and note carefully the effect. When the keynote is struck, there will be a liquid reedy tone imitating an organ tone. This is the keynote.

IV. Another way, practiced by Senator W. M. Stewart and (it is said) by Cicero, is to station a man at the other end of the auditorium, who raises his hand and lowers his hand according as the voice rises and falls, but keeps it stationary when the voice is best audible, and the speaker then voices his utterances in that keynote. The Senator said he did this not knowing the rationale, and Cicero was probably in the same condition.

V. When on the platform, the way the writer tells if he has struck the keynote is to observe the effect on his audience and himself. The most common keynote of auditoriums is F. He usually begins in that key. If it is the keynote, only three or four words suffice as to the audience, which shows by attitude and attention that it hears what is said. Three or four words suffice to the speaker, because he finds that he speaks with ease and feels his voice to impinge on the farthest walls. If he does not find these results, his pitch is raised or lowered till he obtains them.

### Defects of Battleship Texas.

Secretary Herbert gave out on December 31 a formal statement concerning the result of the recent official inspection of the second class battleship Texas, the vessel built by the government at the Norfolk Navy Yard. The statement was submitted to the President at the Cabinet meeting by Mr. Herbert before being made public. The prepared statement is as follows:

The inspection board has spent several days on the Texas, carefully investigating the vessel herself, the machinery, guns, etc. They recommend quite a number of changes and improvements, among others that docking keels be fitted one on each side, such as are now provided for in all new battleships; that various bracket plates be stiffened when a convenient opportunity occurs; that additional watertight doors be fitted to facilitate communication between fire rooms and in passing coal from one side of the ship to the other. The feed pumps are not efficient. They also recommend various changes in the piping, so that any pump can supply any boiler.

The packing in the joints of the hydraulic appliances having deteriorated, leaked so that it was impossible to maintain the necessary pressure to operate the 12 inch guns in the turrets. In the hydraulic pump room the leakage of steam from these joints created a heat that made it impossible for the men to remain. The board suggests that the hydraulic appliances as they are be put in proper condition, in order to fairly test their efficiency. Work is also necessary on the turrets, ammunition hoists, electric firing appliances, etc. The location of the 12 inch magazines between the fire rooms is bad for storing powder, being too hot. The board states that this defect can be readily remedied.

The Texas will be sent to a navy yard, and all the deficiencies pointed out will be remedied, and when this is done she will be a first class ship.

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### A TROPICAL GARDEN IN NEW JERSEY.

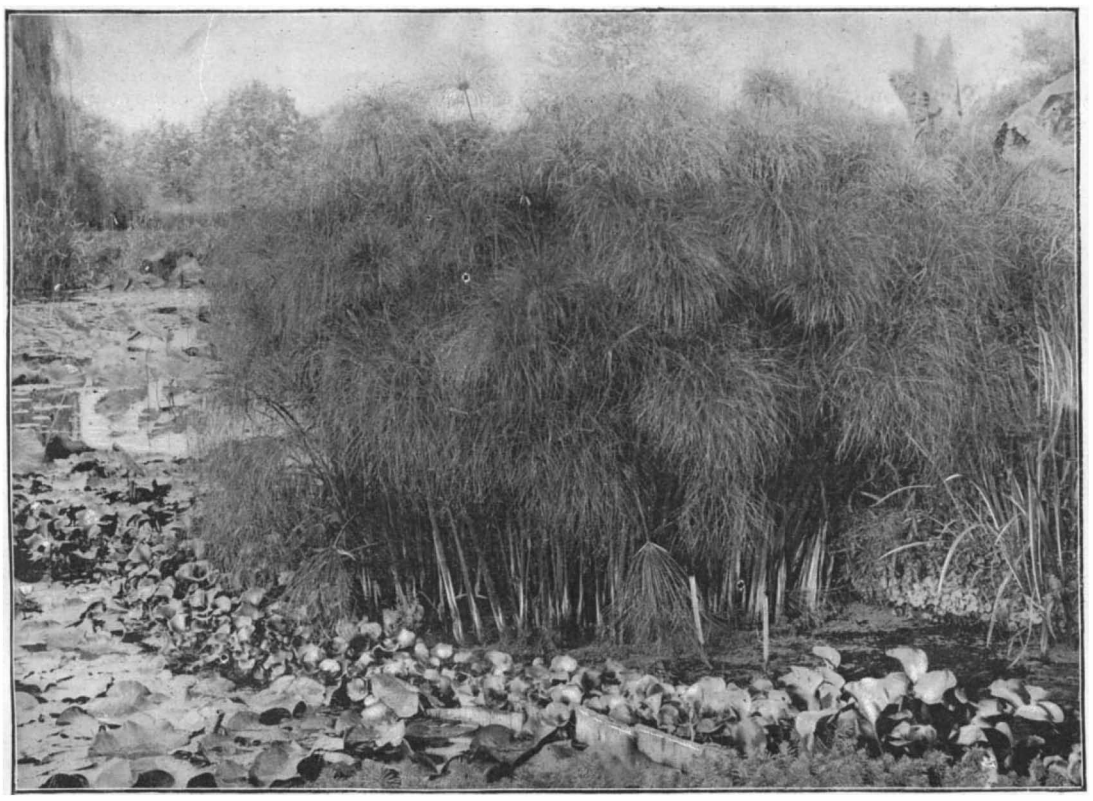
One of the most beautiful spots in this part of the country is at Clifton, N. J., where, through the ingenuity of Mr. S. C. Nash, a little corner of the tropics has been, as it were, mysteriously transported and dropped down in this occasionally frigid region. Mr. Nash has particularly devoted his attentions to the Victoria regia, which is sometimes seen in this country under glass, but which he has boldly brought out into his garden pool, where it flourishes and blossoms like an ordinary garden plant. The domestication of the Victoria is not, however, so simple a matter as it seems: for, even though the domed glass roof is dispensed with, one of the principal features of the greenhouse is surreptitiously introduced, although it is not visible to the eyes of visitors. The water of the pool in which the plants grow is too cool, even during our hot summers, for the Victoria to flourish in, and Mr. Nash has skillfully introduced under the surface of the water coils of pipes, by means of which the water may be warmed to any desired temperature.

The pool in which the Victorias grow is two feet deep and has sloping sides formed with a concrete bottom eight inches thick. There are four pits, each eight feet square, filled with soil for the plants, which grow with such luxuriance that the leaves cover the whole pool, which is about 100 feet by 50 feet. A single plant will sometimes have twenty leaves and several blossoms at one time. The plants are raised from seeds which are started in the greenhouses during the early part of March. The plants are generally moved out into the pool about the middle of May, provided the weather has become sufficiently mild at that time. They are generally protected by a temporary sash until about the beginning of July, when the frame is removed.

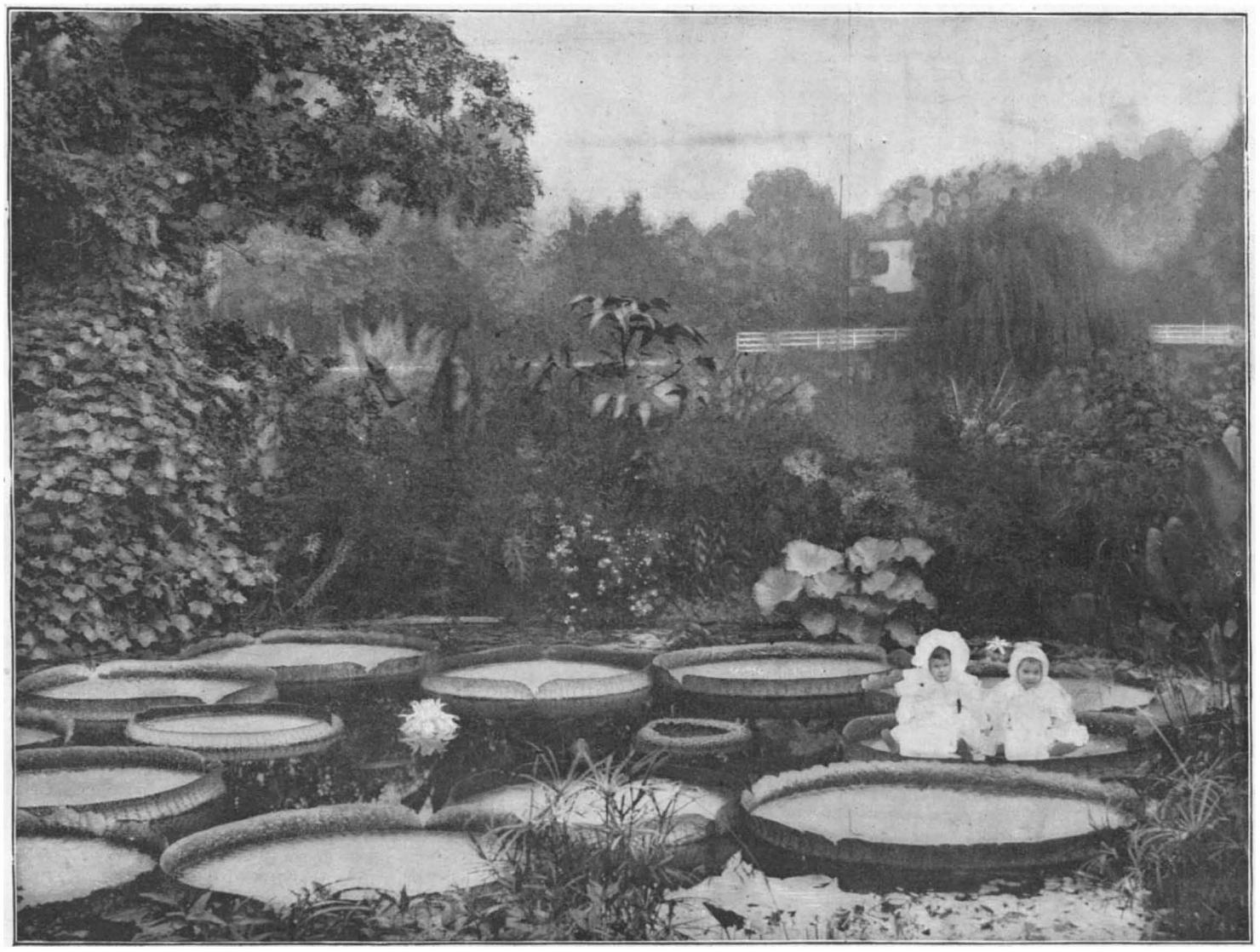
The leaves of the Victoria are from five to seven feet in diameter, and the edge of the leaf turns up a distance of several inches, and they have such a spread of surface that they will sustain the weight of the heaviest man. In the photograph which we reproduce two charming children are quietly and complacently seated. Mr. Nash's garden contains many other beautiful specimens of other varieties of plants.

We show in another view some specimens of the Papyrus antiquoram or paper plant, which grows in all its beautiful luxuriance in a neighboring pool. It grows wild on the marshy banks of rivers in Abyssinia, Syria, and Sicily, but is said to have disappeared entirely from Egypt, where, in ancient times, it grew abundantly along the Nile and afforded a material used to write upon, as we write upon paper. The plant has large and abundant root stocks, which spread in the mud and throw up numerous stems from five to ten feet high, the lower portion being submerged. As cultivated, it has considerable merit as a decorative plant, its tall, naked stems bearing delicate green umbels of slender branching peduncles. Though aquatic, it may be cultivated in pots, if freely watered.

One of the most beautiful plants grown by Mr. Nash is the Egyptian lotus, a photograph of which we expect to publish in a forthcoming number of the SUPPLEMENT. It is a giant-leaved flowering plant, which grows out of the water and raises its leaves and blossoms above the quiet surface of the pool. As some evidence of the attention that has been attracted to this garden, it may be mentioned that illustrated descriptions of the garden have been published in several of the leading horticultural papers, in English where it has attracted great attention.



THE PAPER PLANT (PAPYRUS ANTIQUORAM).



THE VICTORIA REGIA RAISED AT CLIFTON N. J.

### Test of a Battleship Turret Plate.

A plate representing 415 tons of 8 inch turret and barbette armor of the battleship Iowa and the armored cruiser Brooklyn was tested at the Indian Head Proving Grounds January 8, with results unsatisfactory to the manufacturers, the Carnegie Steel Company. Two big ports were cut in the plate to make it represent as nearly as possible a port plate of the 8 inch turrets of these vessels. Only one shot was necessary to determine that the plate was not up to the standard. A 6 inch armor piercing projectile of the Wheeler type, weighing 100 pounds, was fired at the big steel target with a velocity of 1,700 feet a second. The contract for the group which this plate represented required that the shell should do no greater damage than merely to crack it, but after the shot was fired an examination disclosed that the target had been broken into three pieces. There was nothing further to be done, and Captain Sampson, Chief of the Naval Bureau of Ordnance, and the other officers who witnessed the test returned to Washington.

The result of the test will cause the temporary rejection of this group of armor, but a second test will be made, which is likely to prove more successful for the Carnegie Company. The plate which fared so badly was of inferior quality and it is said that it did not fairly represent the other plates in the group. It was selected for the test because of its inferiority, in accordance with the policy of the Ordnance Bureau to choose for this purpose the specimen which is believed to be the weakest in a group, the idea being that, if the poorest plate can stand the severe test prescribed by the bureau, the others must necessarily be able to withstand a greater striking force.—N. Y. Tribune.

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## RECENTLY PATENTED INVENTIONS.

### Engineering.

SMELTING FURNACE.—Hermann Huber, Kansas City, Mo. This improvement provides a charging device comprising a hood with self-closing doors over the mouth of the stack, a track extending through the hood and over the charging floor, the wheeled vehicles traveling on the track having sectional floors and trunnions being carried by each section, which may be opened when desired to discharge the load into the stack. The improvement enables the operator to properly prepare the charge previous to its introduction into the stack, and make an even and uniform distribution of the charge in the stack.

### Railway Appliances.

CAR FENDER.—Henry Kramer, Jr., New York City. This device comprises a body section for attachment to the car, with which is pivotally connected a jointed receiving section, the jointed members of which have an automatically operating lock latch. The receiving section is normally held near the track, and has at its front end a cushioned cross bar, but when an object met by the moving car falls on the bed or net of this section, the forward end of the frame becomes upwardly inclined, forming a pocket in which the object will be retained. The device is simple and inexpensive, may be readily transferred from one end of the car to the other, and when not in use may be folded up against the dashboard.

CAR COUPLING.—Alonzo Kelly, Harrisburg, Pa. This improvement relates to the Janney type of car coupler, arranged to readily and safely couple with the knuckles in either open or closed position, or one open and the other closed. The knuckle has an elongated pivot opening through which passes the pivot, the elongation of the opening being in line with the coupling arm of the knuckle, and there is also a bottom extension on the drawhead, with a forward flange adapted to support the lower ends of the horns of the opposite drawhead.

DUMPING CAR.—Mexico Van Pelt, Moundsville, West Va. This is an improvement on a formerly patented invention of the same inventor, providing for a carriage or dumping platform on the flat body of the car, and shiftable laterally for tilting to discharge its load. The invention includes several novel features, with improved means of securing and locking the carriage or movable dumping platform on the body of the car while traveling, and for shifting the dumping platform laterally to discharge the load.

### Agricultural.

CANE PLANTER.—Antonio M. R. y Aguiar, Havana, Cuba. This is a machine adapted to make a furrow of different depths, as required, or to make two furrows side by side in the shape of a letter W, planting two pieces of cane simultaneously therein without touching each other. The machine carries sufficient cane to plant a considerable area, and cuts the cane in equal lengths for planting, the lengths being varied as desired without dismounting or changing the parts of the apparatus, and the pieces of cane being dropped horizontally into the furrows at regular distances. A coverer closes the furrows, the plow and coverer being raised independently or together, and the machine has a marking device.

POISON AND FERTILIZER DISTRIBUTER.—John W. Randall and Alonzo R. Kibbe, New Richmond, Wis. Paris green or other poison, and plaster of Paris or other fertilizer, either singly or in combination, may be readily applied by this distributer to potatoes, cotton, or other growing vines, the machine being readily adjustable to regulate the quantity and direction of the discharge, and insuring a regular and constant feed of the material used. The powders in the hopper are fed by stirrers and a feed disk in regulated quantities to a fan, whence they are sent by the blast through hose sections and spreaders to the rows of plants with a continuous, certain, and uniform distribution.

INSECT POWDER DISTRIBUTER.—John R. Brown, Eau Claire, Wis. A bellows constitutes the base of this machine, and on the bellows is a poison receptacle with valved delivery pipe, the operation of the bellows revolving a wheel to break up any lumps in the powder, which is fed in finely pulverized condition to the delivery pipe. A slide valve, adjusted by a set screw, regulates the quantity of poison delivered, the feed being proportioned to the speed with which the bellows is operated, and the delivery of the poison being entirely under the control of the operator, so that none need be spilled between plants, the machine being operated as desired on each plant.

BEET HARVESTER.—Albert Philipp, Stanton, Neb. This is a machine designed to first cut off the tops of the beets and then remove their bodies from the ground. The frame of the machine is of strong and simple construction, and supports at its front a cutter, in advance of broad tread wheels or rollers, a second cutter with upwardly curved apron following the rollers, while following the second knife and its apron are diggers to which are attached a sifter or riddle. The apron discharges the beet tops laterally, and the diggers and sifter pull out and screen the beets from the earth, so that they lie exposed on its surface.

### Miscellaneous.

HEATER.—Frank McCarty, Martin's Ferry, Ohio. This heater is designed to burn coal, gas, coke, or other fuel, without danger of accidental spilling or discharging the burning fuel, and is adapted for use in cars and buildings. The fire pot is contained in an inner casing, which is surrounded by an outer hot air casing having inlets in one side wall and the rear wall, a damper being pivoted between the two inlets to close either one. In case of an accident to the fire pot the gases or burning fuel cannot pass into the air chambers and ducts.

MERIDIAN DETERMINING DEVICE.—Martin C. Rice, Lawrence, Kansas. This is an attachment for an engineer's transit, surveyor's compass, plane table or level, consisting of a sectional tube with two parts rotatable in relation to each other about a common longitudinal axis, one of the parts being mounted on an axis at right angles to the longitudinal axis and having twelve hour subdivisions, and the other part having diametrically opposite pin holes and a vernier scale. The attachment facilitates determining the variations of the needle and fixing the true meridian, and by special application of a sun dial may be used to determine the correct time of day. For the latter service the device will be made in attractive form and also in shape for a pocket piece. In its use on a transit, as a latitude and longitude instrument, the declination and refraction are computed in connection with the Nautical Almanac.

AUTOMATIC CISTERN FILTER.—William H. Cox, Cynthiana, Ky. In this filter the water is first strained, then aerated and afterward filtered three different times before entering the cistern, the filter being thoroughly drained immediately after each rain, so that it cannot freeze in winter, and the sediment being washed out through the back of the casing. The filtering material is held in the lower end of a casing in which is an inlet tube, an outlet tube, an intermediate conductor and lateral tubular connections between them, there being a float and valve attachment for regulating the course and discharge of water through and from the filter.

FOLDING UMBRELLA.—Frank G. Grove, Luray, Va. The ribs of this umbrella are made in sections adapted to slide on each other, the lower slidable sections having lugs on their inner ends which, when the umbrella is collapsed, are accommodated in a space between the staff and a collar fixed in the tubular shank. The umbrella, when collapsed, may be tied together in a small package or placed in a suitable bag.

AUTOMATIC FIRE EXTINGUISHING MECHANISM.—George W. Cofran and William J. Murray, Baltimore, Md. This invention provides a chemical mechanism in combination with fusible holding wires and gas generating and distributing devices, a hand-operated valve connecting a water supply and severing the fusible connections, whereby the gas is generated and flows into the sprinkling nozzles. The nozzles have fusible coverings, and alarm devices are connected with the fusible devices by trip mechanism, the severing of the fusible connections setting in operation the alarm devices.

TRUNK.—Florence I. Leonard, Arlington, Ga. This is a trunk adapted for summer or outing trips or for ordinary travel, and has a lower series of drawers extending from end to end, with shorter upper drawers and a commodious hat box, with trays which are so arranged that access may be obtained to any one of them without disturbing the others.

CONVEYER.—Scott Webber, Pigeon Cove, Mass. An endless traveling slotted platform, according to this invention, is mounted on two sets of rolls, a stationary frame carrying one set and a swinging frame the other set, there being means for rotating some of the rolls in the stationary frame, and projections on the rolls engaging recesses in the slots of the platform, while the swinging frame may be raised and lowered. The construction is very simple and may be readily manipulated and arranged to load into vessels irrespective of the rise and fall of the tide.

SECURING WHEELS TO AXLES.—William F. McQuivey, Seattle, Washington. According to this improvement, locking plates pivoted on the wheel hub are adapted to close over a screw in the axle end, while a fastening cap secured to the hub engages the outer faces of the locking plates to hold them closed. It is a simple device for attaching or removing the wheel, and can be operated without the use of tools and without soiling the hands, adding neatness to the appearance and finish of the wheel, and locking the wheel so securely to its axle that it cannot be removed.

VEHICLE DASHBOARD.—Charles R. Steele, Opelousas, La. This dashboard has double walls, forming a chamber to receive two rollers, one above the other, a lap robe on the lower roller extending through an opening to be conveniently unwound as required, while an apron or boot is secured to the upper roller and also extends through an opening in the dashboard to cover and protect the lap robe from rain, etc. The construction is simple and inexpensive, and the lap robe and boot may thus be conveniently stored when not in use.

SAW SUPPORT.—Alva J. Deetz, Sisson, Cal. This invention provides a device for conveniently holding a saw in proper position to permit a single operator to saw down a tree, the invention consisting of a saw table held on a bracket mounted to turn on a shaft journaled on spikes driven in the tree. On the top of the table are recesses in which fit guide wheels engaged by the back of the saw blade.

PAD OR TABLET FOR HOLDING METAL LEAF.—Alexander M. Fraser, Red Bank, N. J. This pad has detachable tissue fly leaves held between its sheets and readily removable, the fly leaves carrying the gold or metal leaf and having at opposite sides plain portions forming stubs, and uncovered by the metal leaf to permit them to be conveniently handled while being removed from the pad or tablet and while the gold or other metal leaf is being applied in use. The device is designed to greatly facilitate the handling of the leaf and prevent waste.

SLATE CUTTER.—Samuel P. Glunt, Union City, Ind. This is a tool for the use of slaters, enabling them to readily and quickly trim the slate as required, and make nail holes previous to placing the slate on the roof. The invention provides a knife mounted in a suitable frame to be readily operated by a lever, the knife having two separated parallel cutting edges, causing the cut particles of slate to give way readily in cutting a straight edge, there being also a punch on the handled end of the lever.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

## NEW BOOKS AND PUBLICATIONS.

THE PROCEEDINGS OF THE CALIFORNIA ACADEMY OF SCIENCES. Second series. Vol. V, Part I. San Francisco. 1895. Pp. 784. 8vo. 74 plates and maps. No index, no title page.

This portly volume contains a number of papers which would prove of great interest to all who are interested in natural history, botany or geology. The work is excellently printed and the plates are well executed. On the whole, it is a remarkable example of what can be done for science by the aid of private enterprise. The work lacks an index and a title page.

TWELFTH ANNUAL REPORT OF THE BUREAU OF STATISTICS OF LABOR OF THE STATE OF NEW YORK FOR THE YEAR 1894. Albany. 1895. 8vo. Pp. 675.

ANNUAL REPORT OF THE CHIEF OF ENGINEERS UNITED STATES ARMY, 1895. Washington. 1895. 8vo. Pp. 536.

ANNUAL REPORT OF THE STATE GEOLOGIST FOR THE YEAR 1894. Trenton, N. J. 1895. Geological Survey of New Jersey. 8vo. Pp. 303. 11 plates.

FIRST STAGE MECHANICS. By F. Rosenberg, M.A. London: The University Correspondence College Press. 1895. Pp. 296. 16mo. 189 illustrations. Price 80 cents.

This work is designed to cover the requirements of the elementary stage of the Science and Art Department in the theoretical mechanics of solids. We have expressed before our opinion of this system of education; so it is not necessary to do so again. In this book a step has been made in the right direction in presenting the subject in such a way that its value as a scientific training of the mind is unimpaired. This book is, therefore, a mean between those text books which attract the interest of their readers but are too superficial and those which, through the desire to be accurate in every detail, are lacking in simplicity.

THE HILL CAVES OF YUCATAN. A search for evidence of man's antiquity in the caverns of Central America. By Henry C. Mercer. Philadelphia: J. B. Lippincott Company. 1896. Pp. 183. Price $2.

This work is an account of the Corinth Expedition of the Department of Archæology and Palæontology of the University of Pennsylvania, and deals with the interesting subject of Prehistoric Archæology in Yucatan. While the expedition failed to result in the discovery of human relics dating beyond the culture layer, the book is yet an interesting account of many important discoveries and relics of past humanity.

BURTON'S MANUAL OF PHOTOGRAPHY. By W. K. Burton, C.E. Bradford, England: Percy Lund & Company, Ltd. 1895. Pp. 184, nar. 16mo. 14 illustrations. Price 40 cents.

THE CAMERA AND ITS APPURTENANCES. By H. J. L. J. Massé. Bradford: Percy Lund & Company, Ltd. 1895. Pp. 64, nar. 16mo. Price 20 cents.

SNAP SHOT PHOTOGRAPHY; OR, THE PLEASURES AND ADVANTAGES OF HAND CAMERA WORK. By Martin J. Harding. Bradford, England: Percy Lund & Company, Ltd. 1895. Pp. 56, nar. 16mo. Illustrated. Price 10 cents.

THE DARK ROOM AND ITS EQUIPMENT. By H. J. L. J. Massé. Bradford, England: Percy Lund & Company, Ltd. 1895. Pp. 64, nar. 16mo. Illustrated. Price 10 cents.

DEVELOPERS: THEIR USE AND ABUSE. By Richard Penlake. Bradford, England: Percy Lund & Company, Ltd. 1895. Pp. 68, nar. 16mo. Illustrated. Price 20 cents.

LANTERN SLIDES: THEIR PRODUCTION AND USE. By J. Pike. Bradford, England: Percy Lund & Company, Ltd. 1895. Pp. 68, nar. 16mo. Illustrated. Price 20 cents.

THE A B C OF RETOUCHING. By Andrew Young. Bradford, England: Percy Lund & Company, Ltd. 1895. Pp. 56, nar. 16mo. Illustrated. Price 20 cents.

With the exception of the first work, these little handbooks all belong to "The Junior Photographer Series," and furnish an admirable collection of low-priced handbooks, by well known photographers. They are freely illustrated and contain many valuable formulas.

ANNUAL REPORT OF THE CHIEF OF THE BUREAU OF CONSTRUCTION AND REPAIR TO THE SECRETARY OF THE NAVY FOR THE FISCAL YEAR ENDED JUNE 30, 1895. Washington. 1895. Pp. 94, 8vo. Folding plates.

A TEXT BOOK ON PLAIN LETTERING. By Henry S. Jacoby. New York: Engineering News Publishing Company. 1895. Pp. 82. oblong 16mo. 32 illustrations and 48 plates. Price $3.

Books on alphabets and lettering number scores, but the majority of them are almost worthless for the use of the practical engineer and draughtsman. The present work is a radical departure from these books, and attempts to give a detailed treatment of the Roman, Gothic and some other styles of plain letters which are suitable for engineering and architectural drawing. All ornamental letters are excluded, as they are seldom required by engineers and architects and constitute the deadwood of most of the previous books on the subject. The examples of lettering are chosen with rare judgment, and the work cannot but prove of the utmost value in all drawing offices of any size. Not only are the forms of individual letters given, but great attention is paid to the relation of the various letters to each other, their spacing, etc. The author is associate professor of civil engineering in Cornell University.

A LIBRARY ON STEAM ENGINEERING. By John Fehrenbatch, M.E. Cincinnati 1895: The Ohio Valley Company. Pp. 803, 8vo. 525 illustrations. Price $5.

This is a handsome piece of book making and is filled with illustrations, formulæ and tables. In the production of this work the aim of the author has been to produce a book which would embrace the entire field of the science of steam engineering and to present the subject in all its various branches in the simplest possible form, so as to bring it within the understanding of engineers of ordinary education. It has also been the aim of the author to include all the information necessary to enable engineers to pass a most successful and rigid examination by inspection officers. There have been many books published which were devoted to conveying the same information, but it is doubtful if any have the rules and examples so fully worked out as the present work, which includes even the details of construction of the engines of the United States battleships. The work is profusely illustrated with excellent diagrams and engravings. On the whole, the work is one of the best non-mathematical treatises on the subject which has come to our notice.

L'OR—GITES AURIFERES—EXTRACTION DE L'OR. Traitement du mineral, emplois et analyse de l'or, vocabulaire des termes auriferes. By H. de la Coux. Paris: Bernard Tignol. 1895. Pp. 328, 12mo. 29 illustrations. Price $1.

Architects', Engineers', and Draughtsmen's Supplies form the subject of a most interesting illustrated price list and catalogue of 250 pages, issued by F. Weber & Company, manufacturers and importers, of No. 1125 Chestnut Street, Philadelphia. It contains a most excellent description of a large variety of articles used in these branches of business, including many new specialties, and particular attention is invited to the special lines of instruments for school, manual training and college use.


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**JANUARY, 1896.—(No. 123.)**

TABLE OF CONTENTS.

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(Signed) ORSON D. MUNN. [L.S.]

In presence of
A. A. HOPKINS.

City and County of New York, ss:

On this 6th day of January, in the year 1896, before me personally came Orson D. Munn, to me known to be the individual described in and who executed the foregoing instrument and acknowledged to me that he executed the same for the purposes therein mentioned.

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(6699) T. J. H. says: Would you have the kindness to give me the formula for making Pharaoh's serpents' eggs? A. 1. These are little cones of sulphocyanide of mercury which, when lighted, give forth a long, serpent-like, yellowish brown body. Prepare nitrate of mercury by dissolving mercury dioxide in strong nitric acid as long as it is taken up. Prepare also sulphocyanide of ammonium by mixing 1 volume sulphide of carbon, 4 strong solution of ammonia, and 4 alcohol. This mixture is to be frequently shaken. In the course of about two hours, the bisulphide will have been dissolved, forming a deep red sulution. Boil this until the red color disappears and the solution becomes of a light yellow color. This is to be evaporated at about 80° F., until it crystallizes. Add little by little the sulphocyanide to the mercury solution. The sulphocyanide of mercury will precipitate; the supernatant liquid may be poured off, and the mass made into cones of about ½ in. in height. The powder of the sulphocyanide is very irritating to the air passages, and the vapor from the burning cones should be avoided by the experimenter as much as possible. To ignite them set them on a plate or the like, and light them at the apex of the cone. 2. Harmless Pharaoh's Serpents.—A new method of making the curious chemical toys called Pharaoh's serpents has been suggested by Vorbringer. The black liquor which results as a useless product when coal oil is purified with sulphuric acid is to be treated with fuming nitric acid. The dark colored resinous matter which swims on the surface is then collected, washed and dried, when it forms a yellowish brown mass having about the consistency of sulphur which has been melted and poured into water. When this mass is ignited it undergoes such a wonderful increase in bulk that a cylinder 1 in. long will give a snake about 4 ft. in length.

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# INDEX OF INVENTIONS

**For which Letters Patent of the United States were Granted**

**January 7, 1896,**

**AND EACH BEARING THAT DATE.**

[See note at end of list about copies of these patents.]

Advertising cigar cutter, G. W. Melville ... 552,645
Advertising device, J. Butzon ... 552,605
Advertising device, revolving, Rupert & Frazier ... 552,700
Advertising device, stereopticon, E. Hudson ... 552,663
Air compressor, L. M. Shaw ... 552,590
Alarm. See Electric alarm.
Automatic switch, G. A. Schmittuz ... 552,622
Awning, J. S. Sanders ... 552,781
Axle lubricator, Whisman & Gerding ... 552,564
Bail handle, W. F. Greene ... 552,758
Bale ties, machine for manufacturing, A. Henley ... 552,837
Band cutter and feeder, A. E. Price ... 552,620
Band cutter and feeder, J. E. Sponseller ... 552,591
Bath. See Shower or needle bath.
Beams, machine for cutting off I-, G. H. Sheldon ... 552,784
Bean picker and cleaner, G. F. Crippen ... 552,748
Bearing, roller, I. Ellison ... 552,752
Bed, invalid, E. C. & T. D. Souney ... 552,672
Bedstead, metal, E. T. McKaig ... 552,770
Berth step, A. E. Crow ... 552,825
Beverage, peptonized milk, A. Bernstein ... 552,681
Bicycle mud guard, Williams & Caywood ... 552,567
Binder self, J. F. Appleby ... 552,503
Blind fixer, rolling, F. Zahn ... 552,603
Blind hanger, Venetian, G. K. Monroe ... 552,871
Blind slat journal, E. F. Newell ... 552,541
Block. See Breech block.
Boat, R. S. Peabody ... 552,618
Boiler. See Sectional boiler. See Steam boiler.
Boiler compound or solvent distributer, H. M. Bolin ... 552,863
Bookbinding machine table, T. A. Briggs ... 552,630
Bookcase, H. J. Hoffman ... 552,579
Book or shipping receipt, duplicating sales, L. S. Lang ... 552,765
Bottle stopper attachment, ink, G. R. Weed ... 552,859
Bowling alley, W. H. Wiggins ... 552,801
Box machine, O. A. Sanford ... 552,782
Brace. See Sweep brace.
Bracket, adjustable end supporting, H. D. Jones ... 552,530
Brake. Car brake. Wagon brake.
Brake rod, Cook & Scott ... 552,824
Breech block, screw threaded, A. Welin ... 552,561
Brickwork, expansion joint for, S. G. Smith ... 552,787
Bridge gate, draw, W. R. Brehmer ... 552,511
Burner. See Gas lighting burner. Hydrocarbon burner. Oil burner.
Button attaching machine, W. E. Elliott ... 552,869
Button, collar, J. A. Trendel ... 552,626
Calipers, micrometer, A. B. Brown ... 552,659
Camera, magazine, F. Whitney ... 552,654
Camera, magazine, A. E. Younger ... 552,570
Camera, roll holding, W. V. Esmond ... 552,633
Car, J. F. Stevenson ... 552,701
Car and vestibule, sleeping, J. L. Bixby, Jr ... 552,682
Car brake, L. S. Fish ... 552,609
Car brake, railway, J. W. Valiant ... 552,599
Car, combined day and sleeping, J. L. Bixby, Jr ... 552,629
Car coupling, W. R. Fine ... 552,608
Car coupling, W. H. Hatfield ... 552,836
Car coupling, H. W. Hueffelman ... 552,642
Car door, Coder & Ruffhead ... 552,821
Car, dumping, Thomas & Melhado ... 552,595
Car fender, Morrow & Robertson ... 552,852
Car fender, M. Sparmo ... 552,789
Car fender, W. P. Young ... 552,656
Car guard or fender, J. Gibbons ... 552,639
Car mover, H. L. Marlett ... 552,537
Car, ore, W. C. Davis ... 552,750
Car, platform dumping, S. Webber ... 552,799
Cars, storm front and lookout window for, J. Hartman ... 552,662
Carbonating apparatus, J. Ormerod ... 552,543
Cart, ash, H. Scheller ... 552,589
Cart, snow and dirt, J. R. Hawkins ... 552,876
Case. See Bookcase.
Cash register, indicator, recorder, and check printer, Thompson & Morton ... 552,554
Caster, W. H. Tucker ... 552,598
Chair. See Typewriter's chair.
Chair seat, H. W. Johnson ... 552,840
Chest protector, O. Riess ... 552,670
Chimney top, W. Eigel ... 552,828
Chocolate dipper, C. Gousset ... 552,833
Clamp. See Fence wire clamp. Stone clamp.
Cleaner. See Dish cleaner. Grain cleaner. Track cleaner.
Cock attachment, angle, E. B. Stoner ... 552,793
Cock, self-closing safety gas, J. Clark ... 552,704
Cock, sirup fountain, C. H. Duffield ... 552,518, 552,632
Coin-freed apparatus, G. Hirschfeld ... 552,529
Collar, J. K. P. Pine ... 552,619
Conveyer, endless chain, C. W. Hunt ... 552,664
Corn husking machine, Campbell & Woodring ... 552,606
Cot, folding, H. C. Rogers ... 552,586
Coupling. See Car coupling. Pump coupling. Shaft coupling.
Cream separator disks, holder for use in cleaning, W. J. Bush ... 552,817
Cultivator, D. Brisky ... 552,684
Cultivator, J. H. Brown ... 552,743
Cultivator, E. F. Louys ... 552,714
Curtain fixture, J. W. Lang ... 552,870
Curtain pole ring, F. Druckhammer ... 552,607
Cutter. See Advertising cigar cutter. Band cutter. Potato cutter. Wire or rod cutter.
Cutter head and jewel burnisher, adjustable, L. N. Jackman ... 552,687
Cyclometer, F. M. Carroll ... 552,819
Dental disk carrier, W. M. Speakman ... 552,625
Dental disk holder, R. M. Chivers ... 552,514
Dental handpiece, J. T. Pedersen ... 552,669
Dental matrix, C. J. Peterson ... 552,697
Dental mouth mirror support, O. P. Myers ... 552,693
Desk, roll top, A. L. Lofstrom ... 552,846
Dish cleaner, F. Rowley ... 552,588
Distilling apparatus, I. H. Jewell ... 552,688
Distilling apparatus, water, E. C. Hargrave ... 552,835
Door, E. A. Hill ... 552,578
Door, swinging and sliding, E. Muchmore ... 552,879
Dredging machine, F. B. Barrows ... 552,810
Dyeing, etc., apparatus for, L. Frotscher ... 552,638
Eccentric, W. N. Reazor ... 552,547
Electric alarm, automatic, T. J. Stansel ... 552,733
Electric alarm, automatic, G. B. Williams ... 552,803
Electric circuit controller, H. A. Gorn ... 552,756
Electric cut-out and insulator, Wagner & Schwedtmann ... 552,680
Electric meter, McGrath & Oram ... 552,540
Electric motor, S. D. Field ... 552,521
Electric motor, G. L. Thomas ... 552,858
Electric switch, S. Bergmann ... 552,574
Electrical circuits, apparatus for protecting, J. M. Oram ... 552,542
Elevator. See Water elevator.
Elevator, T. Van Kannel ... 552,651
Elevator controlling device, C. A. Harkness (r) ... 11,520
Elevator mechanism, hydraulic, J. T. Wilkin ... 552,565
Elevator shaft doors, locking means for, T. Van Kannel ... 552,652
Engine. See Hydrocarbon engine. Oil engine. Oscillating piston engine. Rotary engine.
Evaporator, J. W. Mote ... 552,667
Excavating machinery, D. I. Calhoun ... 552,575
Excavator, J. Kewley ... 552,580
Extension table, W. G. Boughton ... 552,510
Extractor. See Hydro extractor.
Fan, car, C. A. Evans ... 552,660
Fares on railways, device for insuring collection of, G. L. Lukens ... 552,878
Faucet attachment for drawing beer, etc., W. W. Newhall ... 552,771
Feed chopping apparatus, E. B. Case ... 552,820
Feeder and band cutter, combined, M. C. Law ... 552,615
Fence, D. Messick ... 552,616
Fence or arbor post, R. S. Woolfolk ... 552,568
Fence, wire and picket, F. A. Weight ... 552,558
Fence wire clamp, E. E. Dehler ... 552,827
Fence wire stretcher, H. Robinson ... 552,779
Firearm discharging mechanism, W. A. Richardson ... 552,699
Firearm, magazine, J. M. Browning ... 552,864
Fire escape, I. Knapke ... 552,531
Fire extinguisher, chemical, E. F. Steck ... 552,880
Fireproof partition for buildings, A. McCartney ... 552,539
Flues, movable support for expansion, S. A. Griggs ... 552,525
Fluid motor, J. Schade ... 552,872
Flush tank apparatus, S. W. Lewis ... 552,535
Fly paper, sticky, W. C. Jerome ... 552,762
Fly paper, sticky, O. G. Stolz ... 552,792
Fuse and switch box, junction, W. F. Bossert ... 552,658
Gage. See Pressure gage.
Game board, P. S. McGee ... 552,694
Game board, P. G. Smith ... 552,786
Gas heater or furnace, J. W. Baker ... 552,504
Gas lighting burner, electric, J. E. Swendeman ... 552,594
Gas making apparatus, cupola, J. M. Rose ... 552,587
Gate. See Bridge gate.
Gate, O. M. Blood ... 552,683
Gate, E. Kaiser ... 552,764
Gate, O. Larson ... 552,690
Gearing, variable, D. M. Scheffer ... 552,551
Generator. See Hot water generator.
Glass, method of and apparatus for testing, W. Hoskins ... 552,641
Glue, testing tenacity of, G. Seeligmann ... 552,731
Grain cleaner, C. J. Mober ... 552,769
Grain separating machine, L. W. Stevens ... 552,674
Guard, G. F. Fisher ... 552,610
Gun breech mechanism, A. Welin ... 552,560
Hammer, bush, G. Main ... 552,848 to 552,850
Handle. See Bail handle.
Hanger. See Blind hanger.
Harness, fire engine, T. Murphy ... 552,668
Harrow and seeder, E. J. Colby ... 552,822
Harvester, J. H. Elward ... 552,520
Harvester truck wheel attachment, L. Miller ... 552,666
Head protector, J. L. Weber ... 552,557
Heater. See Gas heater.
Heating system, J. C. Febiger, Jr ... 552,753
Hide unhairing and working machine, A. E. Whitney ... 552,628
Hinge, spring, F. Brucker ... 552,815
Hoisting and dumping apparatus, C. L. Carman ... 552,513
Hook. See Lacing hook. Ladder hook. Snap hook.
Hook and eye, M. Shearer ... 552,783
Horse detacher, L. R. Hertert ... 552,706
Horses, device for stopping runaway, W. Crawford ... 552,747
Horseshoe calk forming machine, Steiner & Babbitt ... 552,592
Hot water generator, A. J. Pulver ... 552,698
House, portable, C. H. Leonard ... 552,533
Hub, self-lubricating vehicle, G. & P. Blechschmidt ... 552,702
Hub, wheel, M. Wysong ... 552,569
Hydraulic shears, E. A. W. Jefferies ... 552,710
Hydro extractor, O. W. Schaum ... 552,550
Hydrocarbon burner, A. J. Huber ... 552,709
Hydrocarbon engine, W. D. & S. Priestman ... 552,718
Indicator. See Station indicator.
Inhaler, Anderson & Wagenhals ... 552,656
Inhaler, T. B. & H. Wilcox ... 552,600
Insect destroyer, E. T. Burrowes ... 552,703
Insect trap, H. W. Matthews ... 552,644
Journal bearing or brass, W. B. Lewis ... 552,767
Journal box guard, F. J. Roberts ... 552,549
Kitchen cabinet, G. A. Fischer ... 552,522
Knitting machine and knit fabric, C. Older ... 552,533
Knitting machine, automatic, L. N. D. Williams ... 552,804
Knitting machine, automatic, Williams & Swinglehurst ... 552,806
Knitting machine needle cylinder, L. N. D. Williams ... 552,805
Knitting machine transferring attachment, H. E. Harbaugh ... 552,528
Lacing hook or stud, E. Kempshall ... 552,841
Ladder hook, extension, L. Ferguson ... 552,636
Lamp, electric arc, W. S. Bartholomew ... 552,874
Land roller, L. E. Stump ... 552,794
Lasting machine, E. F. Grandy ... 552,834
Leather graining and softening machine, M. M. Scott ... 552,857
Leather working machine, R. Steyer ... 552,791
Line casting machine, J. C. Fowler ... 552,830
Loading and weighing device, cotton, H. E. Paolucci ... 552,617
Lock. See Sash lock.
Lock case, T. Donahue ... 552,868
Locomotive bell ringer, T. W. Heintzelman ... 552,760
Locomotive fire box, F. D. Shepherd ... 552,671
Loom picker motion, L. C. Werner ... 552,562
Loom relief motion, L. C. Werner ... 552,563
Loom shuttle box operating mechanism, A. Scheid ... 552,720
Lubricator. See Axle lubricator.
Lubricator, F. A. Mitchell ... 552,851
Lumber roller bed and measurer, B. S. Snell ... 552,788
Mail crane, E. L. Peirce ... 552,773
Mail discharging apparatus, H. L. Hewitt ... 552,577
Match safe, J. W. Tully ... 552,650
Mechanical movement, H. E. Harbaugh ... 552,527
Metal for stamping or drawing-in dies, preparing, H. K. Jones ... 552,763
Metal wheel, hollow, W. B. Roberts ... 552,719
Metals from their ores, method of and apparatus for extracting, H. G. Williams ... 552,807
Meter. See Electric meter.
Mining apparatus, placer, R. C. Roach ... 552,856
Mop head, R. V. V. Sutherland ... 552,649
Motor. See Electric motor. Fluid motor.
Mowing and reaping machine, cutting apparatus for, L. Miller ... 552,665
Musical instrument, S. Blacketer ... 552,862
Musical instrument, mechanical, Tremaine & Pain ... 552,796
Musical instrument or toy, resonant, W. H. Frost ... 552,612
Necktie, P. Camillo ... 552,818
Oar lock, A. Stevenson ... 552,673
Oil burner, crude, T. J. Brough ... 552,813
Oilcloth, etc., cutter, Lewis & Kochendarfer ... 552,845
Oil cup, F. D. Winkley ... 552,737
Oil engine, petroleum, J. Carter et al ... 552,686
Oil separator, E. Austin ... 552,572
Ore concentrator, H. R. Ellis ... 552,519
Ores, lead bath apparatus for working, A. M. Shields ... 552,624
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Oven, rotary, G. Huebner ... 552,838
Oyster tongs, F. Paschen ... 552,772
Package elevating and distributing apparatus, F. O. Matthiessen ... 552,716
Paint, rust preventive, A. Buecher ... 552,744
Paper pulp screening machine, W. Curtis ... 552,749
Pen, fountain, C. F. Veit ... 552,679
Pen holder, A. Grollmann ... 552,640
Percussion screen, P. F. Poorbaugh ... 552,585
Phase completing device, J. T. Sibley ... 552,553
Photographic plate holder, Levy & Bell ... 552,766
Picker. See Bean picker.
Pipe. See Tobacco pipe.
Planter sight feed, J. D. Schofield ... 552,552
Planting attachment, H. L. Cooke ... 552,515
Plow stock, J. F. Peele ... 552,545
Plow, sulky, C. Anderson ... 552,571
Polishing material and making same, M. M. Kann ... 552,712
Post. See Fence or arbor post.
Potato cutter, A. J. Wood ... 552,808
Potato sorter and cleaner, J. A. Mitchell ... 552,538
Pressure gage, E. A. Uehling ... 552,678
Pressure gage, T. W. Welsh ... 552,653
Printing press gripper, J. Watson ... 552,627
Printing press roller adjustment, P. Splithoff ... 552,790
Propelling mechanism, R. H. Crosby ... 552,576
Propulsion, marine, A. Holm ... 552,613
Pump coupling, oil well, J. M. Ralston ... 552,621
Puzzle, T. F. Schofield ... 552,721
Radiator and stovepipe shelf, combined, G. Laube ... 552,844
Radiator, steam, M. Jaennigen ... 552,643
Rail joint, R. H. Pierce ... 552,775
Rails of tramways, etc., automatic cleaner for, A. Flabaux ... 552,637
Railway, pleasure, I. W. Moore ... 552,692
Railway system, electric, H. Brandenburg ... 552,604
Railway tie plate, L. A. Bower ... 552,875
Railway water chute, inclined, D. Lenox ... 552,713
Railways, conduit system for electric, C. A. Gaines ... 552,755
Refrigerator, J. F. H. Gronwald ... 553,526
Register. See Cash register.
Ring. See Curtain pole ring.
Rock drilling machine, Van Horn & Hayes ... 525,556
Roller. See Land roller.
Rotary engine, O. E. Morse ... 552,854
Rotary engine, F. A. Small ... 552,646
Safe, portable, R. C. Davis ... 552,517
Sap spout, J. B. Sessions ... 552,623
Sash balance, roller, R. B. Hugunin ... 552,761
Sash fastener, P. Fleming ... 552,611
Sash lock, window, P. S. Riddelle ... 552,777
Sash, revolving window, P. S. Riddelle ... 552,778
Saw, grooving, C. Baar ... 552,573
Saw set, F. W. Brown ... 552,814
Sawing machine, wood, C. V. Barker ... 552,505
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Scale, computing beam, H. E Swift ... 552,676
Screen. See Percussion screen.
Screw machine, C. E. Roberts ... 552,548
Seal, J. E. Williams ... 552,566
Sealing device, bottle, R. Brass ... 552,742
Sectional boiler, J. H. Bacon ... 552,861
Sediment or sand trap, G. Ipson ... 552,877
Separator. See Oil separator.
Sewage system, B. O. Tilden ... 552,677
Sewing machine, Bolton & Rontke ... 552,509
Sewing machine, G. W. Weiss ... 552,559
Sewing machine stand, J. Bolton ... 552,508
Sewing machine table, J. Bolton ... 552,507
Sewing machine work feeding attachment, W. S. Mills ... 552,691
Shaft coupling, F. M. Leavitt ... 552,532
Sharpener, drill, Larson & Carlson ... 552,843
Shears. See Hydraulic shears.
Shirt sleeve, etc., W. F. Williams ... 552,601
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Steam boiler, C. Starke ... 552,648
Steam purifier and separator, J. S. Stephens ... 552,593
Steam raising apparatus, C. Bourdon ... 552,741
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Table. See Extension table.
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Telegraph, printing, J. E. Woodbridge ... 552,738
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Telephone exchange trunk line, T. C. Wales, Jr ... 552,735
Telephone exchanges, multiple switchboard system for, C. E. Scribner ... 552,723, 552,724
Telephone switch, G. W. Coy ... 552,516, 552,705, 552,866
Telephone switchboaad and circuit, Wales, Jr., & Spencer ... 552,734
Telephone switchboard annunciator, C. E. Scribner ... 552,727
Telephone switchboard spring jack, C. E. Scribner ... 552,725
Telephone system, F. R. Colvin ... 552,823
Telephone transmitter, I. J. Kusel ... 552689
Telephony, F. R. Colvin ... 552,865
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Testing machine, M. H. Tomkins ... 552,597
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Toy marble shooter, W. E. Everitt ... 552,634
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Trap. See Insect trap. Sediment or sand trap.
Trolley, B. Dale ... 552,631
Trousers supporter, H. Shrier ... 552,785
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Corsets, E. Schweinburg ... 27,589, 27,590
Corsets, ladies', Michigan Corset Company ... 27,591
Ethyl nitrite, preparation of, F. W. Fletcher ... 27,616
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Gloves, F. Schmidt ... 27,609
Gloves for women and children, wool, silk, and cotton, Lord & Taylor ... 27,588
Hams, Fowler Brothers ... 27,597
Hooks and eyes, Singer Safety Hook and Eye Company ... 27,593, 27,594
Horseshoes, Shoenberger Steel Company ... 27,606
Lamps, bicycle, Hitchcock Lamp Company ... 27,627
Lumber, yellow pine, Simpson & Company ... 27,608
Medical vaporizers, R. E. Woodward ... 27,600
Paper and envelopes, Hurlbut Stationery Company ... 27,586
Plows, J. Wallace's Sons ... 27,607
Preparation, certain proprietary, Brandreth Company ... 27,620, 27,621
Radiators and boilers, Gurney Heater Manufacturing Company ... 27,628
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Remedies for general prostration, coughs, colds, and similar troubles, Humphreys Homeopathic Medicine Company ... 27,599
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Soap powder, Diamond Dust Soap Powder Company ... 27,602
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Tonic, Prune-Manna Company ... 27,618
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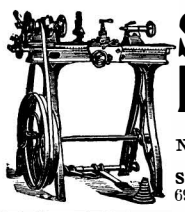

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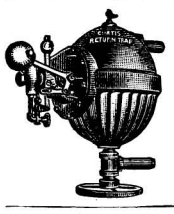

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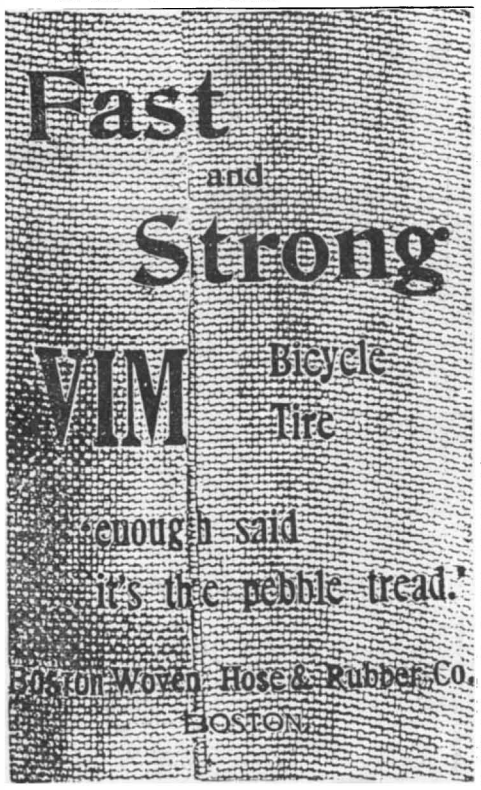


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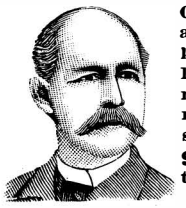

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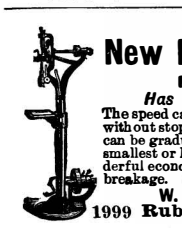

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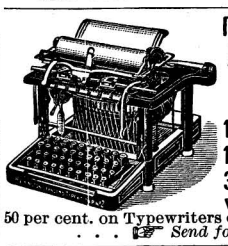

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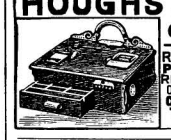

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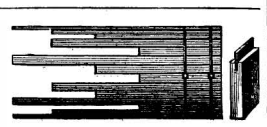

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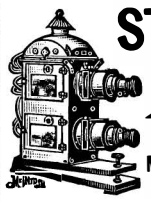

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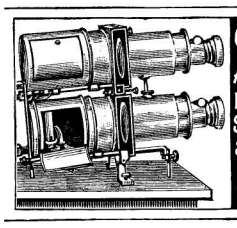

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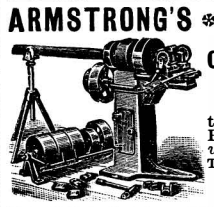

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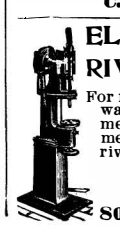

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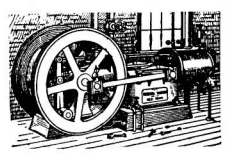

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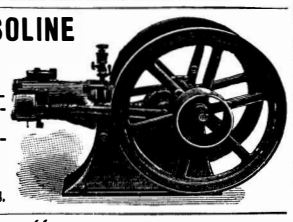

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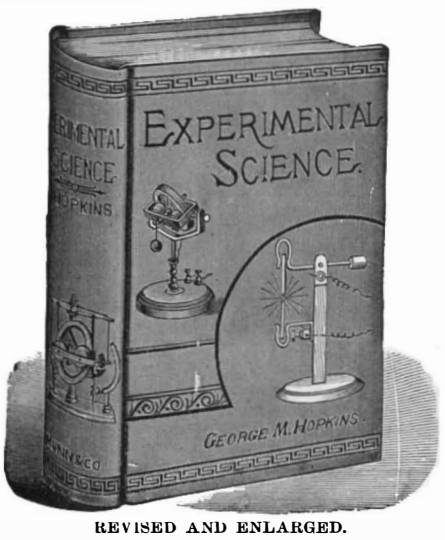


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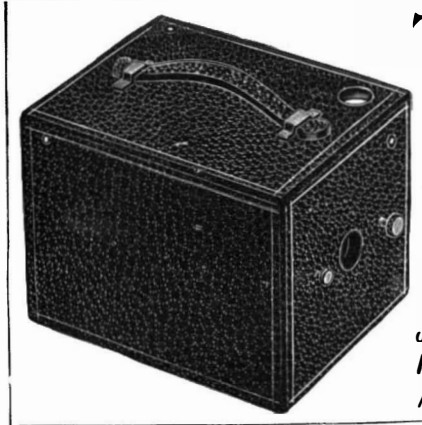

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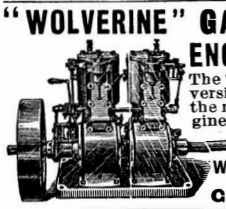

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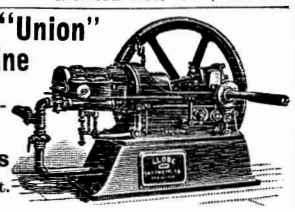

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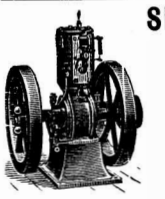

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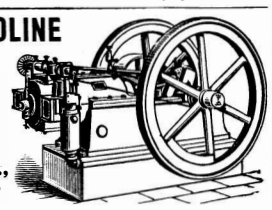

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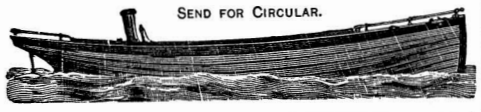

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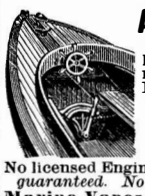

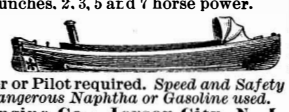

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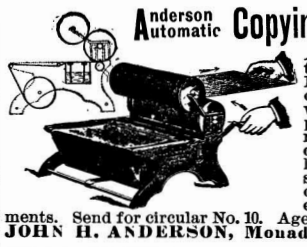

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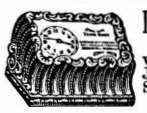

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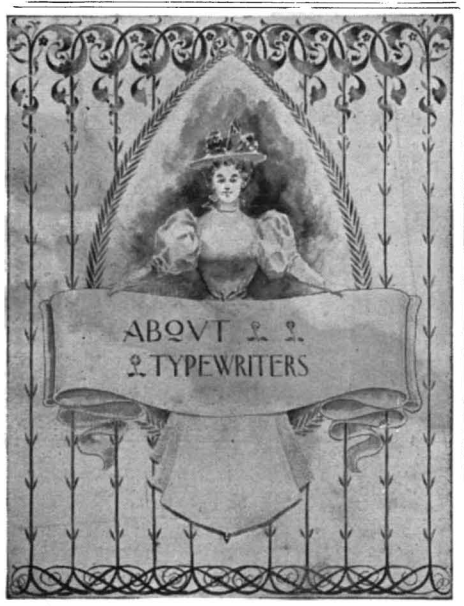


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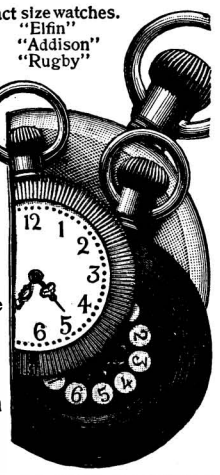

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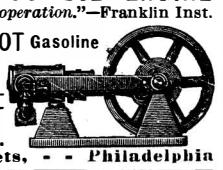

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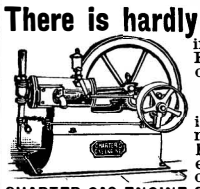

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